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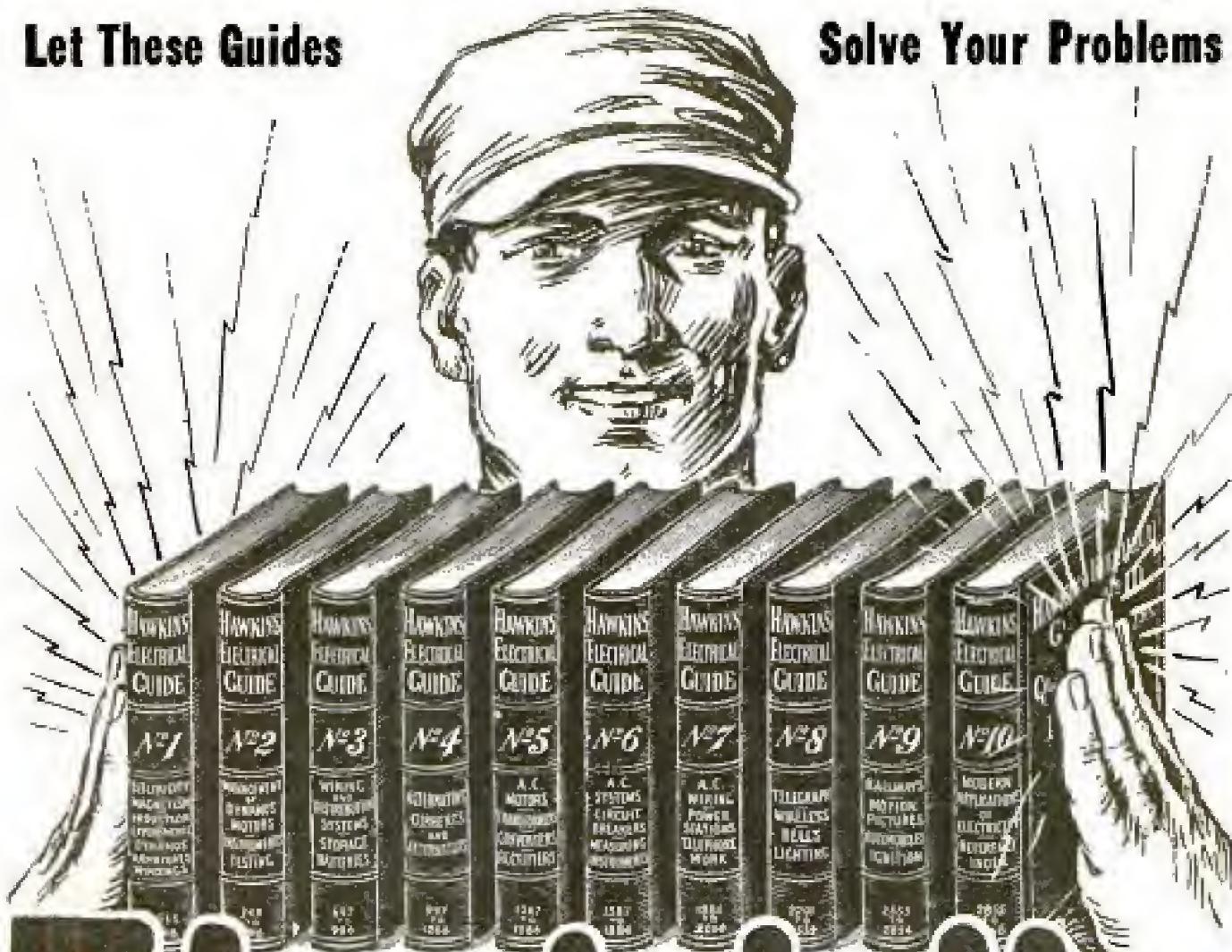
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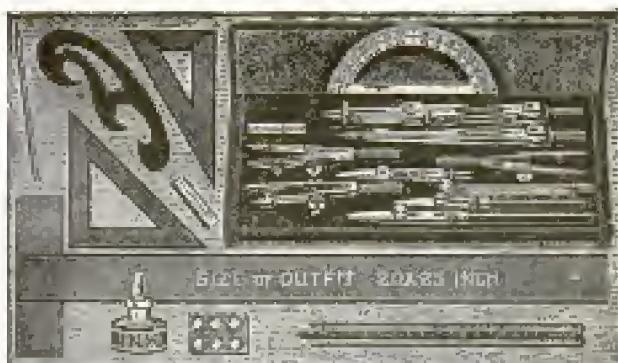
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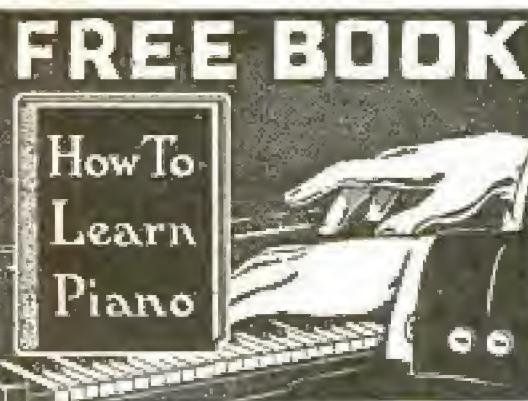
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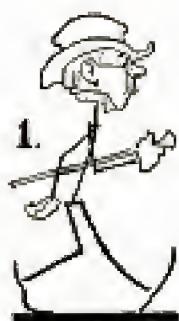
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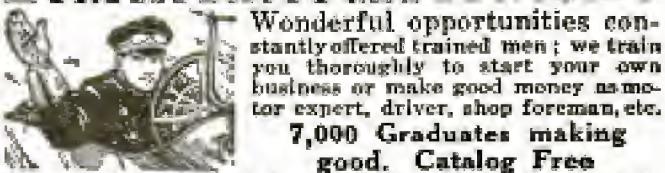
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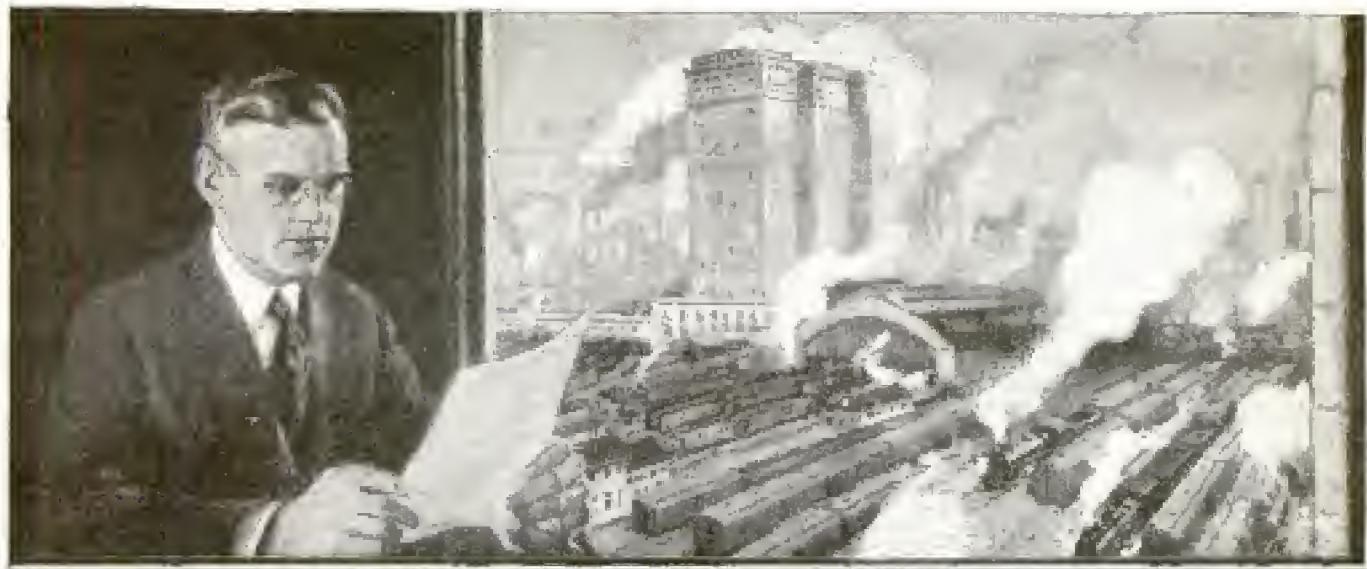
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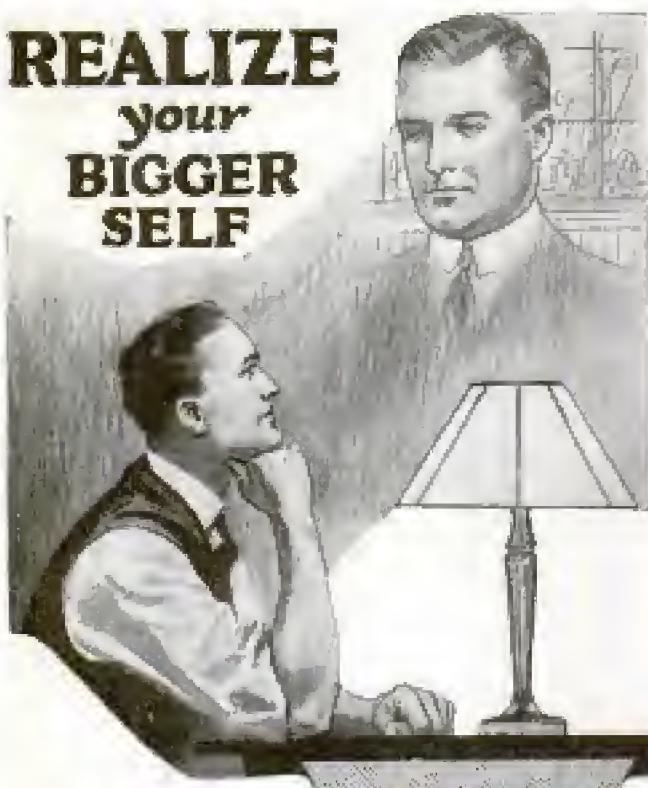
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There is nothing exceptional about these men. They'd tell you that themselves. Many had been clerks, bookkeepers, mechanics. Some had been policemen, farmhands, firemen. And then in one swift stroke, they found themselves making more money than

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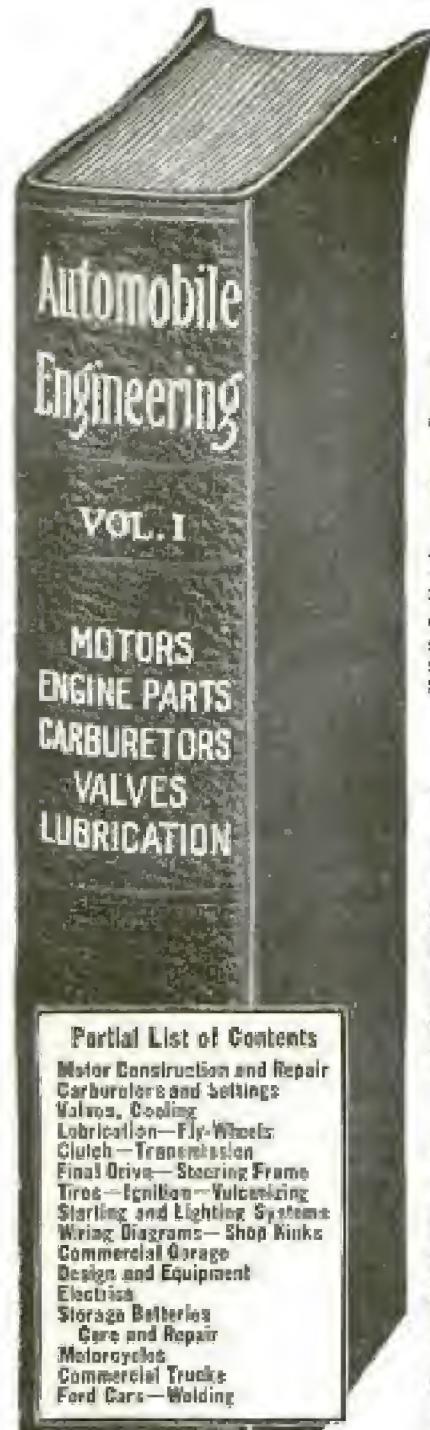
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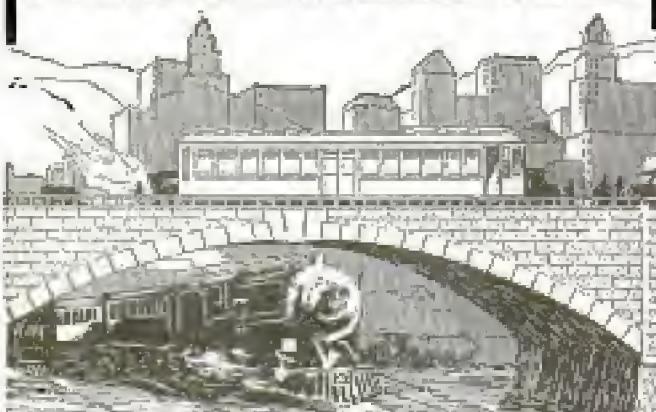
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home. Get raw materials in any drug
store. Guaranteed to last. Copy of for-
mula with instructions for use and permission
to sell pieces (50c). Express or Interna-
tional money order. Antonio Formulas,
Santa Catalina, 12 La Coruna, Spain.

FORMULAS—Catalogue free, "Clover,"
5501K, North Robey, Chicago.

FORMULAS. 20c—Luminous Paint, Paint-Varnish Remover, Gasoline Tonic, Hand Cleaning Paste, Auto-Furniture Veneer, Battery Renewer, Auto Top Dressing, Polishing Cloth, Cementless Patches, Furniture Plagger, Auto Body Cleaners, Auto See-Clean. Entire Collection \$1.00. Myers, Box 280, Reading, Pa.

UNMARKABLE Discovery—Positively removes tobacco, coal marks, moles; safe, sure, simple process. Original since 1918. Formula \$1.00. Harding Co., 142 Dearborn St., Philadelphia.

FORMULAS of the latter sort. Write for our free catalog. National Scientific Laboratories, 421 Main, Birmingham, Va.

\$3.00 **FORMULAS**—400 pages, \$1.00. Catalogue free. Englewood Book Shop, 7021A So. Winchester, Chicago.

FREE—Formula Catalog, S. & H. Laboratories, Dayton Building, Chicago.

BUSINESS SERVICE

SOUTH Checkers, Rock Hill, Collections, Legal Business, J. H. Foster.

INCORPORATE. Our lawyers do the work, saving you time, expense and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D-488, Phoenix, Ariz.

AGENTS WANTED

WINDWIND money-maker for agents—sample free. Sell powdered Handstick, an absolutely new, non-combustible and unbeatable hand cleanser. Removes grease, grime, ink, paint, etc., without slightest injury to skin. Its use spreads like wildfire. Cheaper than all others. Sells in cans, for bulk with dispensers; to garages, autoclubs, mechanics, factory and other folks, to hardware stores and to auto supply houses. Huge quantities used weekly by mercantile houses. (Names on request.) Big repeat business assured. Exclusive agencies, etc., working for you, fast sales, splendid profits and a permanent business for starters. Live ones can clean up \$500 a month. Send 2c stamp for postage on Free sample. Complete sales plan goes with it. Write quick to Solar Products Company, 124 W. Lake St., Chicago, Ill.

25% PROFIT: Quick, Easy Seller. Klean-Brite, New Washing Compound, Washes Clothes without rubbing. Women will eat it. Write quick for Free package and Special Offer. Beeserry Products Co., 1911-K, Irving Park, Chicago.

AGENTS—Salesmen—Dealers. 50c postal order brings Agent's Sample and wonderful offer on newly invented self-cleaning-test-pocket magnetic extractor for removing foreign bodies from the eye. Everybody buys them. Under Extractor Co., (Int.), 2024 Main St., Chicago.

\$100 REWARD will be paid to the first person who proves that the Keystone Economizer fails to save 25% to 30% of our car's ordinary gasoline consumption and entirely eliminate carbon. This is a bona fide offer. The Keystone Economizer is a real gasoline saver which has made good. Results Guaranteed. More mileage, more power, less cost. Fits any car. Easily attached. Saves its cost in a month. \$4 postpaid. Splendid offer for factory representatives, agents and salesmen. Write or wire for particulars to Keystone Economizer Co., Stock Exchange Bldg., Los Angeles, Calif.

TAILORING Agents Wanted—Make \$500 to \$1000.00 and more per week, selling our wonderful all wool and pelot line. Suits sell for \$20.00. None higher. Retail stores ask at least \$50.00 for the same quality. Also strong line of featherweight fabrics to sell at \$10.75 per suit. You collect your profits at once. We ship C. O. D. to customer for balance. We furnish beautiful 6x6 swatch outfit and powerful co-operation. Hustlers wanted at once. Salesmanager J. R. Simpson, Inc., Dept. A-81, 881 West Adams Street, Chicago, Ill.

AGENTS—Here's a sure winner. We pay \$3 an hour for your spare time taking orders for "Zacol" Pure Food Flavors. Miss Edith Haut made \$34 in one week. Write for sample case. Makes beautiful display. Shows 18 articles of best and tastiest flavors of Flavors, Soups, Perfumes, Toilet Articles, etc. Every woman buys. Big repeaters. Have a steady income. Customer must be satisfied or money back. Send for sample case today. American Products Co., 5725 American Bldg., Cincinnati, Ohio.

AGENTS Wanted—Something New—Fire Fighter sells easily. Makes a spectacular demonstration—car owners, homes, factories, stores practically buy on sight. Our men make \$10 to \$50 a day—exclusive territory. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fyr-Fyer Co., 102 Fyr-Fyer Bldg., Dayton, Ohio.

AGENTS \$5 a day taking orders for Invade Tyres. Positively prevent punctures and blowouts. Guaranteed double tire mileage. Old worn out tires will give 8 to 5 thousand miles more service. No tools needed. Just slip inside casing before replacing tube. Will not heat or pinch. Has made over \$500 first month. Biggest selling on the market. Low priced. Write for territory. American Argentines Co., B-1678, Cincinnati, Ohio.

MANUFACTURERS Agents—District Manager—Crew Managers—Get immediately our proposition. Mother Goose Wringer Mop—New, Patented, Perfect. Saves the back—Housewife stands erect to do all washing—Hands never touch the water. Retail \$1.50. More than 100% profit. Sample prepaid \$1.00. We had to double size of factory last year to handle the orders. You can make a small fortune. The Alline Company, 6921 Euclid Avenue, Cleveland, Ohio.

AGENTS—Enormous profits selling Genuine Gold Leaf sign letters. Guaranteed not to fade. Establish a permanent business or travel. Anybody can do it. Free samples. Guarantee Sign Service, A-430 South California Ave., Chicago.

AGENTS—Easy, quick sales. \$60 to \$100 weekly. Valuable free premium to every customer. You write orders. We deliver and collect. Commissions daily. No capital or experience. Wonderful new solid aluminum handle, big cutlery set, sells itself. Best year-round proposition. Sample outfit free. Also free Ford car offer. New Era Mfg. Co., 803 Madison St., Dept. 21, Chicago.

EVERTLAY Photographic Needle, plants 25,000 times. Better tone and reproduction. Preserves records. Fits all photographs like ordinary needle. Not a jewel. Point rounded as usual from 3 inches of soft special alloy wire coiled within the needle. Saves \$40. Retail \$1.00. No dealers to buck. Big profits. Examples, 1 Melkay Bldg., San Francisco, Calif.

We pay \$7 a day taking orders for Stainless Steel Cutlery Set. Guaranteed. Aluminum handle. We deliver direct to your customer and pay you every day. Big demand. No capital or experience needed. Big money for spare time. Complete outfit to workers. Parker Mfg. Co., 278 Avi St., Dayton, Ohio.

WHITE Quick for territory and samples of joy, interest, most up to date soft drink product out. Nothing like it. Makes delicious refreshing summer drinks for the home, parties, parties, etc. Agents make \$40 to \$100 a week. Postal will do. Arthur N. Chisley & Co., 50 Main, Newark, N. J.

\$5 TO \$15 daily introducing new style guaranteed hosiery; must wear or replace free; no capital or experience required; just show samples; write orders. Your pay in advance; we deliver and collect; elegant outfit furnished, all colors and grades, including silk. Mac-O-Chee Mills Co., Desk 10, Cincinnati, Ohio.

AGENTS—We want agents to sell our Guaranteed Batteries for Automobile Starting and Lighting; our Batteries are right in quality and price. (Ford size sells for \$10.00.) We will furnish you instructions for installing, and pay you a good commission. Box 38, Defiance, Ohio.

MOOTON Ignition Amplifier—A Wonder Invention! Gives new power to an old motor and more power to the new. Sell to garages, accessory dealers and users. Quick action, big money and satisfaction. Write for prices and literature. Motor Ignition Corporation, Mfgs., Albany, N. Y.

BIG Profits Selling New \$2.50 Automatic Billing Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily sets. No competition. Pocket size. Business people everywhere positive customers. Thousands being sold. Tremendous demand. There's high-grade money-maker. Bassett Co., 1455-D, Hollywood Ave., Chicago.

HIGH-GRADE agents for entirely new accessory for any automobile. Makes night driving safe. Can carry in pocket; every car owner buys. Fits any make. Men who can stand big profits and stay on job. Ray Auto Filter Company, Marion, Ind.

PUT the Allen Day and Night Electric two-way Auto Signal any place on your car and operate it with your left hand on the steering wheel. In the U. S. \$10.00. Agents wanted. Allen, 105 North 6th St., Portland, Ore.

MAKE \$12.00 to \$15.00 daily. Sell Crimp Grip Clothes Line Fasteners. Every housewife a prospect. Over 5,000 satisfied purchasers in one community. 50¢ brings you one pair and one demonstrator's sample. Money back if not satisfied. Write for particulars. Don't delay. Crimp Grip Company, Belvidere, Ill., Dept. M.

AGENTS writing today with our women's household aprons and other rubberized goods; children's aprons, pinuppers and man-bags, utility bags, etc. Best goods made at local prices. Write for catalog 11. The Schafbau Corporation, 446 Broome St., New York, N. Y.

AGENTS—Here's Big Money and Independence. \$2.50 invested nets \$28.25 profit—\$5.00 nets \$83.00. Apply initially to side doors of auto. Every car owner a prospect. Newark Monogram Company, Desk 10, 588 Broad Street, Newark, N. J.

MAKE \$50.00 to \$100.00 and more per week, selling our wonderful all wool one price line. Suits sell for \$29.50. None better. Retail stores ask at least \$50.00 for the same quality. Also strong line of feather-weight fabrics to sell at \$18.75 per bolt. You collect your profits at once. We ship C. O. D. to customer for balance. We furnish beautiful full switch outfit and powerful co-operation. Hustlers work at once, to Salesmanager J. R. Simpson, Inc., Dept. A-81, 881 West Adams Street, Chicago, Ill.

SPECIAL offer to agents to sell full line of rubber specialties; uppers; baby supplies; drug supplies, etc. We make deliveries and collections. For information write to Everybody's Rubber Supply Co., 220 Third Ave., Pittsburgh, Pa.

PATENTS—Trademarks. Before disclosing an invention, the inventor should write for my blank form "Evidence of Conception." This should be signed, witnessed and notarized to me with sketch or model upon receipt of which I will promptly render opinion as to patentable nature and send booklet on Patents, Highest references, Prompt attention, Reasonable terms. Clarence B. O'Brien, Registered Patent Lawyer, Woodward Building, Washington, D. C.

MAKE \$50 Daily. Something New 400% profit. All business, professional men need it. Sells \$1. Costs \$1. Brooks, Texas, sold 20 first day, profit \$80. Big weekly repeater. Sells quickly. Experience unnecessary. Write today for territory wanted. Sample outfit free. Federal Association, 71-K Asylum St., Hartford, Conn.

\$2 A DAY Easy—Selling remarkable new invention "Simple Trailing Board Covers." Biggest seller in years. Every woman wants one. New agent sold 100 in ten days (profit \$75.00). You may do as well or better. Write quick. Address, W. J. Lynch, Box 118, Springfield, Ill.

SJM'S Slim Ventilator gives positive relief for sweaty and tender feet. Absolutely new growth article. Easy sales. Agents wanted to buy in dozen lots. Send \$5.00 for sample pair—credited on your first one dozen order. Full particulars, W. B. Sims, 815 Mason St., Portland, Ore.

AGENTS—District agents. Power, a new polish that varnishes; sells on demonstration to households and automobile owners; big repeaters and big profits; exclusive territory for hustlers; exp. unnecessary. Write for city or county rights. American Power Corp., 500 W. 43rd St., New York.

DISTRIBUTORS or Salesmen can make quick commission profits selling line necessary also necessary to trace or users. Retail \$1.75. Exclusive territory available or can be sold same sections as continental immediate delivery Midland Approved Agencies Corp., Box 14, Ann Arbor, Mich.

AUTO-LAVATORY. Keeps Magazines Clean, Invisible, Perfected, Cheap, Necessary. Blotting Device Out. Sells on Sight. Trial Satisfaction Guaranteed. OK, Carbon Gum—Scientifically Removes Carbon. Saves Money and Time. Big Seller. Agents' Sample, \$1.25. No competition. Emmens Manufacturing Co., Allentown, Ohio.

AGENTS. Knocks the spots out of all fabrics. Great for spring cleaning. Clean everything. Guaranteed Dry Cleaner. House to house or sell to stores wholesale. Unlimited demand. Send \$2 for formula and full instructions. Bright Star Chemical, 1246 Michigan, Chicago.

AGENTS—Men or Women—Build a substantial business selling article that steadily increases and repeats. Sold under money-refund guarantee. Territory being rapidly assigned. Write for particulars today. The Zeta Company, Inc., Dept. 14, 1818 Broadway, New York City.

AGENTS—Big money, \$8 to \$16 a day. Aluminum handle cutlery set. Brand new. You display and take orders. We deliver and collect. Pay you daily. Sample free. Try it out. Jennings Mfg. Co., Dept. 1668, Dayton, Ohio.

\$12 WEEKLY to start. You sell. We deliver. New beautiful Cocoanut handle cutlery set sells itself to men or women. Five-year guarantee. Sample free. Eastern Kitchenware Co., Franklinton, N. Y.

SALES Representative wanted every country to give all or spare time. Position worth \$1,200 to \$3,000 yearly. No previous experience or capital necessary. Write for full particulars. A. A. Silver-Chamberlin Co., Clayton, N. J.

COLD Sign letters for stores and office windows. Photo pillow tape, portraits, frames, effect pictures, medallions, waterproof aprons, novelties. Samples, catalogue free. Thirty days' credit. James C. Halle Co., Desk 55, Chicago, Ill.

GOOD Opportunity for Few Reliable Men. Sell advertising thermometers made by the world's largest thermometer makers. Liberal commissions. Sales easy. Write giving experience and references. T. W. Mc Taylor Instrument Companies, Rochester, N. Y.

SKILL Mongo Stetite Patches for tires and tubes. Every Auto Owner and Dealer buys. Appoint Sub-Agents. Exclusive territory. Sales Plan and Free Sample. Mongo Products Co., 533 Ikewdale, Pittsburgh, Pa.

3 IN 1 Bars, \$5 per dozen. Sells for \$1.25 each. Send 50¢ for sample. Write for catalog of 100 sure sellers. Economic Sales Co., Dept. X, Boston, Mass.

CARHAGE Cutter, 5 knives, slices 20 vegetables, like alabaster, don't rust, never dulls. 20,000 users Cincinnati alone, endorsed by Good Housekeeping Institute. Sample 45¢. Meyer Co., Orlando Ave., Cincinnati, Ohio.

SALESMEN—Agents sell 150 articles, cost 2¢; no selling plan; no canvassing or talking required. Plans Free. Sample 15¢. H. & C. System, Dept. F1, Box 477, Chicago.

SOMETHING Big. Man puts you on our mailing list one year. You receive latest money-making opportunities, propositions, from manufacturers and supply houses everywhere. Kentucky Agency, Covington, Ky.

SIDE line men and agents wanted to sell novelties. Tell us what territory you cover. Your references. We do the rest. Bradford & Co. Inc., St. Joseph, Mich.

\$50,000 "PROFITS in Portraits" explains in Free Circular. 24 hour service Prints. Portraits, Frames. Samples Free. Picture Man Friedman, Dept. B, 127 N. Dearborn, Chicago.

AGENTS sell newly invented Pie Timer and Crisper. 100% profit; sample and particulars 20 cents. Address Don Risk, 1378 W. Cedar Ave., Denver, Colo.

BIG profits, men or women, selling non-competitive Ford Bedan and open-car beds. Bates Hotel Beds. Owners Equipment Company, 512 Mayer Building, Milwaukee, Wis.

AGENTS—Sell Our Marvel Can Opener. Make \$4 on every \$2 invested. Our tip—your opportunity. Write us now. Staples Mfg. Co., Mt. Vernon, Ind.

SELLS like hot cakes! big profits; new bronzing wax; perfumes clothes with lasting violet perfume. Working outfit 10c. Yankee Manufacturers, 350 Atlantic Ave., Brooklyn, N. Y.

LATEST, neatest, simplest folding automobile and camping stool ever devised. Sells also like wildfire at parades, public gatherings, etc. 100% profit. Muecke, Alhambra, Calif.

A BUSINESS of your own—Make sparkling glass name plates, numbers, checkerboards, medallions, signs; big illustrated book free. E. Palmer, 513 Webster, O.

AGENTS and Salesmen wanted for a high-grade shoe polish. Write for territory to Varsity, 116 N. Paulina St., Chicago, Ill.

AGENTS make \$1.50 on every shirt order from manufacturer direct to wearer. Menzah Shirt Co., 3863 3rd Ave., New York City.

WONDERFUL seller! 2,400% profit! Different Done brings sample, full details. Refunded on first order. Address Frost, Box 67, San Diego, Calif.

WANTED—Representatives to handle "Success" Products. Used every day in every home. Sales Department, Elma Commercial College, Newark, N. J.

AGENTS—Wonderfully fascinating pocket novelty just patented; mammoth profits; sample twenty cents. Address L. L. Martin, Paterson, N. J.

PONKETKNIFE with renewable blade. Wonderful seller. Agents wanted everywhere. Sample 25¢. Particulars free. Kolar Company, Dallas, Texas.

HALIT'S Fruit Drink Tablets. Sample drink ten cents each. E. C. Aschert, St. Louis, S. D.

\$10 DAILY Easy with my specialty. 500% profit. E. Home, 1967 Warren, Chicago.

AGENTS—Don't overlook our proposition on page 142, C. B. Haven Co.

PROTECT Your rights. Write for Record of Invention which contains form to establish evidence of conception of your invention. Prompt personal service. Preliminary action without charge. J. Benney Kelly, 612 G, Columbian Bldg., Washington, D. C.

\$5,000 IS easily yours in 1922. Greatest Ford Accessory ever invented. Performs \$20 job for \$2. Every Ford owner buys on sight. Exclusive territory. Reserve yours today. Leslie Motor Co., 80th and Vincennes Ave., Chicago.

AGENTS: 100% Profit. King Carburetor for automobile engines and King Vapor Flash Gas Heater especially bought by auto owners. Write for our special offer. Get started now. Address King-Gates Company, Fort Madison, Ia.

SALARIES Agents, men or women: Year-round position. No layoffs. Take orders for Jennings new guaranteed laundry. Must wear and save satisfaction or replaced free. Write for outfit. Jennings Mfg. Co., Dept. 188, Dayton, Ohio.

MEN wanted to work in the metal reducing oxidizing and plating lines. \$12 daily and quick advancement assured. Work is permanent. No capital or experience necessary. Write for particulars. Metalabro Co., 1133 Broadway (113), New York, N. Y.

AGENTS. Beginners, well-established men. Valuable tips and inside information free. 200% profit. Also 17 auto specialties. Nico Mail Order & Supply Co., 600 27th St., Denver, Colo.

AGENTS are making fabulous sums selling out gold leaf house numbers and signs, such as: "Deliver Goods in Hour," "Notary Public," "Rooms," etc. Write for particulars. Crest Glass Sign Works, 844 Allendale St., Chicago.

SOMETHING new in stove and nickel polish; wall clear and polish nickel parts and blacken stove in one operation; men and women agents and customers wanted. Gabel Brothers, Hamerville, N. Y.

MONEY Made quickly taking orders for portrait medallions. No investment required. No competition. Send for our 1922 Illustrated Catalogue and details. Puffin & Goldstein, Dept. D, 259 Bowery, New York.

"GLARESCOPE"—New auto accessory, just out, nothing else like it on the market; \$15.00 to \$20.00 daily over; retails at \$3.00. Write for exclusive proposition, American Reflecto Co., Hammond, Ind.

WRITE for particulars. Best article ever offered men. Costs 5¢, sells quick for dealer. \$20 daily, easily made. Knapp, 158 Fifteenth Street, Milwaukee, Wis.

AGENTS—Unusual opportunity. Handsome profit to live agents. Every autoist convinced by demonstration. Write today for attractive proposition. Address Bland Products Co., 4319 McPherson Ave., St. Louis, Mo.

SELLS Wilson hats from factory to wearer. Extraordinary commission. We deliver and collect. Every man a customer. Address Wilson Hat Works, Dept. P, Montclair, N. J.

WHY not make \$7.25 on each sale? Make more money easier and quicker than ever before. Address Paul G. Towler, Ashton Bldg., Grand Rapids, Mich.

EARN \$10.00 daily silvering mirrors, plating and refurbishing metalware, autos, chandeliers, bedsteads. Units furnished. E. Debe Laboratories, 226 Fifth Ave., New York, N. Y.

\$50 WEEKLY selling self-threading needles. Sample terms, etc., 10c. T. Castle Co., Hagerstown, Md.

AGENTS make big profits selling guaranteed Fountain Pens. Details and sample \$2.00. Money refunded if unsatisfactory. Golden State Mfg. Co., 125 Maiden Lane, New York.

AGENTS—Men or women. New household article. Make \$5 to \$15 daily. Big repeater. Send at once for particulars. Address National Industries, Elmira, N. Y.

AGENTS—Nuxen Ink Powder sells houses, offices, schools, stores. Guaranteed satisfactory. Send 20c for package. Other necessities. Kline Chemists Co., Dept. 5, Rockland, Maine.

AGENTS. Just out! No Bag attachment for screen doors; big profits; sample 25¢. Manufactured by Andrus & Co., North Easton, Mass.

SELLS Belts. Demonstration sells every man. Priced so you undersell stores. Make \$50-\$100 weekly. Sample free to workers. Mathias, 35 So. Dearborn, Chicago.

AGENTS—Don't overlook our proposition on page 142, C. B. Haven Co.

AGENTS make big money, selling Earl's Cutwell Pecker Point Sharpener. Sells on sight. Sample free, full particulars. E. G. Earl, 56 E. Randolph, Chicago.

SIGNS for stores and offices. Entirely new. \$50 week easily made. Chicago Sign System, F150 W. Austin Ave., Chicago.

HIGH employment earnings. Start Little Mail Order business anywhere. Everything furnished. Stamp brings Instruction Booklet. R. Pier, 72 Cortlandt Street, New York, N. Y.

EXTRACT Men: Sell Vanilla, Lemon and Orange in bulk at one-half price. Wonderful profits. Profit 200%. Address Trust Manufacturer, Temple, Maine.

SELL good durable paints and varnish \$6 a gallon interest you? Then write today. Unit. 2, Bimbermann Bros. Mfg. Co., Indianapolis, Ind.

AGENTS—The fastest selling and newest known article on earth. Imported Atlantic Pramelle Hand Ventilator Fan. Thompson, 706 Chestnut, St. Louis.

\$3.00 DAILY soliciting. Opening Agencies for Brasherspinning Blades, or Selling Finest Improved \$1.00 Razors. Standard Safety Razor Corp., Pittsburgh, Pa.

AGENTS—200% Profit handling full line Quick Selling toilet preparations. Write today for catalogues. National Soap Company, 20 E. Lake St., Chicago.

COLLECT Names—Highest Prices paid. Instructions 5¢. Easterbalm Co., 1821-1½ Webster, Denver, Colo.

JUST Out! Four quick sellers; samples free. Benedict, 2309 Flora, Dallas, Texas.

SELL—"Tricks of the trades"—Drawing Lettering, \$1.00. Freedburn, Blacksville, Ohio.

WONDERFUL New Invention. Sharpening Razors and Safeties. Free Trial. Schmidt Mfg. Co., Winesburg, Ohio.

MEN Only. Sell New Novelty. Sample 25 cents. Howard Held, Meriden, Conn.

RAZORSHIFE—Agent's sample 10c. Glas. 5112 Farnham Ave., Chicago, Ill.

ST BRINGS Sample and big salary offer. Sunok-O, Longdale, Oklahoma.

POSITIVE Repeater. Enormous Profits. Every housewife needs. Sample 10c. Address Philip Co., Popular St., Chippewa Falls, Wis.

AGENTS Plan, make 30% profit. Write Box 191, James City, Pa.

WANTED—Agents and Salesmen to handle Europe's Famous Wonder Glass, the newly imported Prism "Bimuracite." For theatre, hunting, shooting, racing, touring, aviation, etc. This is the smallest and at the same the most powerful glass in the world. Can be carried in vest pocket or ladies' bag. Retail at \$25.00. Confidential wholesale price to agents \$12.50. Send money with order to George Mayerle Optical Co., General Importers, established 1884, 950 Market St., San Francisco, Calif. (Send for catalog.)

SUBSCRIPTION Agents Wanted to sell subscriptions for business magazines. Big book—leader in its field. No turn in. Our men make \$15.00 to \$30.00 a day. Exclusive territory. This is an unusual opportunity to make a permanent and profitable connection with one of the biggest trade-paper publishers in America. Only high-grade men will be considered. Send references and photo, which will be returned if desired. Penton Publishing Co., Cleveland, O.

AGENTS: \$60 a week selling guaranteed leather for men, women and children. Must wear 12 months or replaced free. All styles and colors, including finest line of silk hose. Mrs. McCullough makes over \$2000 a year. Mrs. Schuman averages \$60 a month working spare time. Geo. Nelson made \$105 in one day. Write for sample catalog. Thomas Mfg. Co., Class 302, Dayton, O.

\$40 DAILY can be made selling Marvel Picture Postcards. They go as fast as you can hand them out after demonstrating in stores, restaurants, etc., or direct to school children. See ad page 149. Send 50c for 3 sample sets and wholesale price list. The Novo Co., Department 2, 396 River St., Chicago.

AGENTS—Don't overlook our proposition on page 142. C. D. Haven Co.

TERRITORY Salesman: First popular price Fire Extinguisher ever made. Retail \$5. Others cost \$15. Every home, office or factory can be sold. One man sold 12,000 in Dayton. Peak cleaning up in Detroit. \$800 a week. No capital. No experience. Territory going fast. Write Thurston Mfg. Co., 173 Fox St., Dayton, Ohio.

STARTLING Agents' proposition—\$100 weekly selling Holly's Washday Wonder. New Classical, Dirt Softener, Harmless. Cleans without rubbing. Enormous profits. Repeat orders assured. Experience unnecessary. Territory going fast. Samples going fast. Samples free. Holly Chemical Co., Al. Hastings, Neb.

P舅E twenty-three Karnt deep gold leaf, aluminum leaf and many other styles of entirely new window sign letters. Boston Window Lettering System, 210 Dover St., Boston, Mass.

AGENTS—Big money taking orders Belts, Pants, Blankets, Bedjackets, direct wooden mill to weaver. Big values. Doublette made \$100.00 first week. Plaintiff makes \$200.00 weekly. Samples costs free. Taylor, Wells & Co., A2740 N. Paulina, Chicago.

AGENTS: See our display advertisement on page 157 in this magazine, then write us immediately. Wide awake agents need no other line. Address: Sales Dept., The Kaso Company, Cambridge, Mass.

DOZAL—In cubes—cleans and polishes stove and nickel trimming case operation; nothing like it on market; sensational seller and repeater; 100% profit, usually demonstrated, wonderful leader. Address W. B. Williams Co., Montclair, N. J.

\$25.00 REWARD paid for any Corn Great Christopher Positive Corn Crop cannot remove. Also good for Waris, Bunkins, Moles and Callouses. Price 5c. Particulars free. Reliable Specialty Corporation, Buffalo, N. Y.

AGENTS, Men or Women, full or spare time, earn \$25.00 to \$100.00 a week and be your own boss representing the Ho-Ho-Co Mfg. Co., manufacturers of the wonderful Ho-Ho-Co Tonic, the great blood purifier and weight builder; some profit-maker. Ho-Ho-Co Moisturized Skin and Scalp Soap for the baby, toilet, bath, skin and scalp; a repeater. Over 100 other fast-selling specialties, toilet preparations, perfumes, flavoring extracts, soaps, medicinal preparations and household specialties. Every item a fast seller and a big profit-maker. Don't fail to ask for one free sample rate offer. We furnish advertising matter and samples free of charge. Ho-Ho-Co representatives are successful. Write today. Ho-Ho-Co Mfg. Co., 154 Locust St., St. Louis, Mo.

WONDERFUL Small Article, every man needs. Agent sold 11 one office; profit \$2.50. Carry hundred in pocket. Particulars and 2 samples 25c. Arrow Manufacturing Co., 1620 Lloyd, Milwaukee.

DEPENDABLE Gold Jewelry—Specialties, Beautiful Marline Diamonds, Rings, Scarf Pins, Snap Links, Stretching Knit Buttons, at Factory Prices. Very profitable line. Master Jewelers, Sheboygan, Wis.

LEAVEN modern automobile Lubricating Business Correctly. No Previous Experience Required. Big, unlimited money-making opportunities everywhere. Fred DeWitt, Sheboygan, Wis.

AGENTS: Sell Wolverine Laundry Soap. Big Profits. Monthly bonus to workers. Write quick. Wolverine Soap Co., 314 Winter St., Portland, Mich.

NEWEST, fastest-selling household necessity. Agents wiring for gross lists. Sample free for 10c postage. C. Ludwig, 1269 Broadway, New York.

"**MILLIONS** Will Be Sold." Latest Creation, \$2.00 investment gets \$50.00 three days' work. Dept. 105, 4035 Minneapolis, Minneapolis, Minn.

AGENTS Learn about the profits supplying perfumes to families. Ask Leffler & Co., 755 Walton, St. Louis, Mo.

AGENTS make \$50.00 weekly selling Yankee Wringer Mop; sample free. Scher Co., 2248 North Ave., Chicago.

AGENTS; We have Sheep Wool polishers, cleaners and dusters. Bennington Dealer Co., East Boston, Mass.

AGENTS \$1,000.00 monthly. See our advertisement under "High-Trade Salesmen Wanted." Poster Laboratories.

FITS any Collar, Samples, etc., 10c. Necktie Fum & Holder, Elgin, Ill.

HOW and **What** to Invent for profit, free. Patent News-A, Washington, D. C.

GOOD prices paid for butterflies, insects, See Sinclair's Display Advertisement, page 26.

AGENTS, salesmen, jobbers, dealers—every policy owner a customer! Lite Pre-senter—a disposable remedy for white diarrhea, rags and cholera among poultry. 16 oz. bottle, \$1.00 postpaid. Walter Achard, 4803 Lincoln Ave., Chicago, Ill.

"**HOW** to Sell Patents" free. Patent News-H, Washington, D. C.

AGENTS. Self-threading needles. Fastest household seller. Sells 10c. Costs 4c. Address Maher Co., Dater, N. J.

MANUFACTURER offers unusual opportunity to experienced crew manager or agents in your home territory. This is an opportunity of a life time for right partition. Product is best seller ever offered and repeat business is simply phenomenal. Tremendous demand already existing with absolutely no competition. If you're making less than \$300.00 monthly—write. All replies considered confidential. State experience and qualifications fully. C. L. Beardley, Rock Island, Ill.

\$8.00 TO \$12.00 a day. Experience unnecessary with our original ideas. Housewife necessarily used in every home. 25c to \$1.50 sale right out of ten calls. Not sold in stores. Territory going quick. Big concern. Write quick for free sample and plans. The Jiffy Soap Products Co., Dept. 1, Dayton, O.

MAIL Order Business is your opportunity. Bremer's Famous Handbooks teach how to start small, grow big. Sell merchandise, service, ideas; enormous profits. Spare time to begin. Get complete set, 10 books, \$2, and be posted. Bremer, 205A Walnut, Philadelphia. Descriptive Catalogue and big batch interesting mail order information, 25c. None free.

NO dull times selling food—people must eat. Federal Distributors make big money; \$2,000 yearly and up; no capital or experience needed; guaranteed sales; unsold goods may be returned; your name on packages, build your own business. Free Samples to customers. Repeat orders sure. Exclusive territory. Ask now! Federal Pure Food Co., Dept. 10, Chicago.

AGENTS make \$5.00 per day in spare time introducing Greatest Tire Valve on the market. Stops and prevents leaks. Fits all tires. Rush for particulars. Sample 50c. Stoplik Tire Mfg. Co., Buffalo, N. Y.

AGENTS: Men and women, in spare or full time, make big money selling household necessities. Every home a prospect. Quick sales, big profit. Territory open. Write for particulars. Judi & Leland Manufacturing Company, Box 24, Clifton Springs, N. Y.

AGENTS—Sell Patented Cigar Lighters and Cigar Case Holders. Big Profits. Start making money at once. Write for particulars, rate and sales plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MEN or **WOMEN**—Enormous Profits selling Duo Guaranteed Products. Easy Sales at every house. All or spare time. Big repeaters. Write Quick. Duo Co., Dept. V-1, Attica, N. Y.

BILLS Pudding Powders—Delicious dessert. Fast solvents; quick repeaters; big profit. Rush for terms and sample. C. H. Stuart Co., 75 Broadway, Newark, New York.

WANTED—Responsible man to take Eastern State Agency and Distributor for Food Timers. Quid A. Egira, Kindred, No. Dak.

POLISHING Cloth—great seller—big profit. Get our proposition. Newton & Co., 19 Main St., Newark, N. J.

AGENTS—Sell Electric Body Batteries for Nervous Diseases and Rheumatism. Neelich & Co., Indianapolis, Ind.

EVERYBODY uses Extracts. Sell Duo Double Strength Extracts. Complete line necessities. Big repeaters. Write today. Duo Co., Dept. E-1, Attica, N. Y.

HIGHEST, fastest sellers. Every woman buys Hastings' High Grade Toilet and Household Necessities on sight. 100% profit. Colonial Chemical Co., 311 Penn Ave., Pittsburgh, Pa.

FREE Sample "Chain Shield Wiper." Retail \$1.00—Costs You 25 Cents (200% Profit). Every Automat buys quickly. No Cloth. No Paste. No Mechanical Attachment. (1) Itch Soaps Windshield clear 48 hours against Rain, Snow, Storms. Inspection Just Out, Prevents Accidents. (Willams makes \$12 Hour.) Experience Unnecessary. Wonderful Pocket Shield. Write Quick for Your Free Sample. Kulu-life Co. Corporation, Hartford, Conn.

AGENTS—Here's big money and independence. You starts your own business. No independent—our line assures your future prosperity. Jack Comb Strips are not a novelty but a necessity—a quick seller and big repeater. What others have done you can do. Act now—write for proposition and exclusive territory. We bring sample. The Jay Company, Dept. G, Washington, N. J.

100% PROFIT selling our felt rugs to homes, hotels, offices, etc. Everybody buys. We are manufacturers, not jobbers. Prices defy competition. \$55 week easy. Newark Felt Rug Company, 56-C Bergen Street, Newark, N. J.

MIDWEST Collapsible Garment Baggets sell fast. Portable size in beautiful leather case. 100% profit. Sample 35c. Money back if not satisfied. Kallan Company, 284-38 Alabama Avenue, Brooklyn, N. Y.

MANUFACTURER Extracts, and other necessities 200% profit; we tell you how. Write White Manufacturing Drug Co., Box 222, Cincinnati, O.

NEW Carter. Patented pen, No knots, pads, etc. \$1.00 doz.; \$4.50 gross. Art Needle Co., 512 N. Dearborn, Chicago, Ill.

MAKE big money, whole or spare time, selling high grade Pure Aluminum Combination Cooking Utensils with new features that every housewife wants and can afford. Our unique plans make you welcome and get the business. Exclusive territory—no sales limit. Here's chance to connect with a live one. Unlimited stock—prompt shipments. Apply today—Now. Perfection Aluminum Mfg. Co., Lemont, Ill.

SOFT Drunks In Powder; ten kinds. Just add cold water and sugar; no trouble. Fine for the home, picnics, parties, dances, etc. Many make \$10 to \$30 day. Two-glass package, best drink you ever tasted, and particulars 10¢ postpaid. Marsteller Company, 4405-11 Madison St., Chicago.

IMMENSEE profits selling rear-seat automobile safety sleep-lights. Prevents accidents. Costs \$1.35, retails \$5.00. Sample sent C. O. D. with full particulars. National Stoplite Co., 178 W. Randolph, Chicago.

SALES-PERFIL, \$1.00 starts you in business. Costs 15¢, sells for \$1.50. The package sent for 4c. Address Supply Co., Somerville, N. J.

AGENTS: 1922's Greatest Sensation. Unique toilet article set selling like狂热 at \$1.75 with \$1.00 dressmaker's shear free to each customer. Line up with Davis for 1922. E. M. Davis Co., Dept. 500, Chicago.

PLYMOUTH Bags. We are selling this popular bag in green, black, blue and brown leatherette, cottonine lined, \$5-\$6.50-\$7.25 and \$10 per dozen. Sample 60¢ prepaid. Write for free samples of material. R. Condon, Mfg., 12 Pearl St., Boston, Mass.

LIVE Agents make \$10 day selling Eureka Shampoo and Splash Presector for every water faucet. Takes off dirt. Widely advertised and known. Get details today. A. J. Seal Filter Company, 73 Franklin, New York.

MAKE 600% Profit. Free Samples, Lowest priced Gold Window letters for stores, offices, Anybody can do it. Large demand. Exclusive territory. Big future. Side-line. Acme Letter Co., 2900-B, Congress, Chicago.

POLIMENT Polishing Cloth works like magic. Cleans all metals. Gets the attention and money. Fast seller at 25 cents. Sample Free. A. A. Gile Company, 15 Marlboro Street, Boston.

WORLD'S Fastest Agents' Seller. 400% Profit. Needed in every home, office and store. Establish permanent profitable business. Free Sample. Popular Mfg. Co., Detroit, Mich.

\$1.00 SALE means 75 cents profit for you. Wonderful New Automobile Invention. Each Quick Demonstration Means Sure Sale. Experience not necessary. Riley made \$1000 three days. Stocum made \$10 first hour. Prevents Accidents. Give Better Service. Carried in Pocket. Mail 25 Cents for \$1.00 sample. (Never Back Instantly.) Write quick for Sample and Exclusive Territory. (Invention, Box 494), Hartford, Conn.

AT Last—World's Greatest Adding Machine. Almost human. Retails \$15; work equals \$200 machine. \$200 monthly easily made, demonstrating to stores, offices, garages, factories. Simple, easy; adds, subtracts, multiplies, divides, automatically. Speedy, accurate, durable, handsome. Five year guarantee. Tremendous demand; amazing profits. Liberal trial offer. Protected territory. Write quick. Lightning Calculator Corp., Dept. F, Smith Bldg., Grand Rapids, Mich.

AGENTS Sell Neverfall Iron Rust and Stain Remover. Huge profits. Big line. Sample. Write today. Sanford Seal Co., Newark, N. J., Dept. 4.

AGENTS—Advertising Pencils, ready sellers, excellent shillines. Write for requisition. North American Pencil Works, 310 So. Canal St., Chicago.

AGENTS—\$60-\$200 a week. Free Samples. Gold Sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 421-C N. Clark St., Chicago.

GALLAGHER made \$30.00 in one week selling guaranteed Collection Systems, used by all business men. Rogers Mfg., 2815 Sheftow Ave., Chicago, Ill.

BIG profits. Sell Plate Glass Wind Deflectors, Rear View Mirrors, Aluminum Frost Scrapers and 20 nationally advertised accessories. Car owners, Dealers, Garages buy one to gross. Write quick for illustrated catalog and agency prices. Rapid Sales Corporation, 11-D Grand Rapids, Michigan.

AGENTS—Big Profits. Gold Sign letters easily applied, nothing free. Liberal offer to General Agents. Dept. C, Interstate Sign, 2620 No. Halsted St., Chicago.

RAVEN BIG Money Fast applying Lithogram Initials to automobile doors. Every owner buys. \$1.25 Profit on each sale. Full particulars mailed. Address, Lithogram Company, 17-S East Orange, N. J.

YOU can make \$12,000 a year selling well-known, standard, advertised make of hand-drawn chemical fire engines, motor fire apparatus, extinguishers, hose, and complete line of fire-fighting sundries. We have several openings in good territories. Other men are making \$1,000 a month in territories not as good as we now offer. Address Ajax Fire Engine Works, Bush Terminal Bldg., 10, Brooklyn, N. Y.

\$1,000 MADE by Wingo in six weeks selling Never Fail Razor Sharpeners. Party made \$10.00 first day. Other inexperienced men cleaning up big money. Apply white, Ia., six orders in thirty minutes. Hurry—Investigate—exclusive territory. Write today. Never Fail Co., 126 Allen Bldg., Toledo, O.

AGENTS wanted to handle good automobile accessory line. Free commissions. J. D. Ignition Construction Co., 6724 Lowe Ave., Chicago, Ill.

AGENTS—Big profits acting "Whirlpool Polish" for Furniture, Woolwork, Auto, Etc. Clean and Polish. Fritch's Laboratories, 6431 Magnolia, Chicago.

WONDERFUL article for direct selling. Address, Sanitary Mfg. Supply, Dept. 2, Akron, Ohio.

SELL Ladies' Art Embroidery Needles Bring in 50 cents. Eugene Marquis, 5209 North Keystone, Indianapolis, Ind.

AGENTS Make \$10 a day selling Pressure Trouser presser and crisper. Connally, 65 Vesey St., New York.

AGENTS Wanted to sell an imported tool that often pays for itself first time used. Address today, J. 1019 Georgia St., Los Angeles, Calif.

\$1,000 PER man per month. Get yours, inexperienced men putting down your salesmen's profits. Write for proof: How farmers, ministers, clerks—men in all walks of life—make big money in while or spare time. You can do it. Amazing promotion—wanted everywhere. Exclusive territory—no sales limit. A hot or cold running water bath equipment for any house at only \$7.50. Self-heating. No plumbing nor water works required. Investigate. Terms: Send no money. Write letter or postal today. Allen Mfg. Co., 654 Allen Bldg., Toledo, Ohio.

PORTRAIT Agents—A new portrait something entirely different. Write for particulars, also catalogue and order list. Fidelity Portrait Company, Dept. 100, 3047 Harrison St., Chicago, Ill.

WHY work for others? Make and sell your own goods. We show you how. Numerous profits. Write quick for free book explaining everything. National Scientific Laboratories, 623 Main, Richmond, Va.

AGENTS, we have the finest needle case. You can clear \$50.00 to \$200.00 weekly. Send 10¢ for sample, tells you. Empire Specialties Co., 1519 N. Wells, Dept. 291, Chicago, Ill.

SELFOLITE—Agents, Streetmen—Sell self lights any size while user sleeps, or any time. Perform surprising stunts. Newly patented. Sample 25¢, postpaid; money back. Patriotic Mfg. Co., 4195 Station A, Boston, Mass.

AGENTS: Big Profits. Genuine Gold Leaf Window Letters anyone can put up. Script and 57 varieties. Chicago Agency Co., 422 Almond St., Chicago.

AGENTS wanted to sell "Hercules Tensil" 50 cigars in Smokers and Snuff. Hercules Tensil Cigar Co., Utica, N. Y.

BUILD Permanent Business following our Sure Success Plan. Introducing Guaranteed Hosiery and Underwear from factory to family. Attractive outfit assures quick sales, large profits. Investigate for yourself. Adelicks C & D Company, 41-B, Grand Rapids, Mich.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., for new method; producing amazing results; every household possible customer; experience unnecessary; simple plan of manufacturing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Ornamental Finish Co., Ave. H, Decatur, Ill.

COPPER Pots, all sizes; also anything in copper goods desired. Write today for free catalog. Mayr & Co., 620 Reserve Bank Bldg., Omaha, Neb.

GOLD Leaf Sign Letters: make and sell profits exceed 100%; immense demand; particulars free. Johnson Co., Quincy, Ill.

AGENTS—Tele Remedies (pat.). Address Tele Remedy Co., 1381 Franklin, St. Louis, Mo.

AGENTS—New Invention. Harper's Tenuse Brush Set and Fibre Screen. It sweeps, washes and dries upstairs windows, screens and mops floors and does the other things. Big profits; easy seller. Free trial offer. Harper Brush Works, Dept. X, Fairfield, Iowa.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 37 Star St., Canton, O.

If you need good big agents—fellow who can run the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. H. McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

THE Successful Agent—Free sample outfit worth \$2.25. "Quality" beauty preparations. Make big money. Extensive line. Established 50 years. Lyons Co., 218, Logansport, Ind.

FREE—Formula Catalog. S. & H. Laboratories, Baystate Building, Chicago.

AGENTS make 140% profit. Indiana crochets shawls in the dark. Sells for \$2.00. Costs 8¢. Complete line religious articles, certificates, bulbs, switch plates, house numbers and match boxes. Novelty Crayon! Felt! Every house a prospect. Big sales. Get free demonstrating outfit. The Pioneer Corporation, 1230 W. 63d St., Chicago, Ill.

AMETHYST booster auxiliary water carboator makes auto burn water. Eliminates carbon. Low cost; liberal profits; details free. America Co., Dept. 178, Cincinnati, Ohio.

ANY man handy with paint brush can start new mechanical business on nearly nothing; needed everywhere; nearly all profit; experience not required. John Harrelson, 1137 So. Ninth, Philadelphia, Pa.

AGENTS—Clever Invention. Inkspot makes every ink a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marti Company, Tribune Bldg., New York, N. Y.

WHITE for particular; best article ever offered men; costs 5¢, sells quick for dollar; \$15 daily; sworn statement. Bench, 22 Pershing Blk., San Diego, Cal.

SILK Newspapers. Everybody needs and buys the "Business Guide." Present cleared \$500.00 in July. Send for sample, it's free. Nichols Co., Box 4-B, Naperville, Ill.

AGENTS make 300% profit handling Auto Memoranda, New Pictures, Window Letters, Transfer Flags, Novelty Signs. Details free. Write Clinton Co., Star City, Ind.

PORTAIT Agents, who want good work and prompt service and who desire to perform their favors at fairway prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

AGENTS—New patented curtain rod, necessary in every home; big profit; 4 to 10 sales at every house. Write for free sample. License Curtain Rod Co., Providence, R. I.

LARGE shirt manufacturer wants Agents to sell complete line of shirts direct to wearer. Exclusive patterns. Big sales. Free samples. Madison Mills, 503 Broadway, New York.

CALIFORNIA Rosebuds selling like hot cakes. Agents coming money; new stuff. Big profits. Catalog free. Mission Head Co., P.M.-2819, West Pico, Los Angeles.

AGENTS: Big Money Monogramming By Transfer Method. Catalogue Showing Over 60 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

\$200 WEEKLY. Free samples. Sell gold sign letters to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Ame Letter Co., 28401 Congress, Chicago.

MAKE \$25 to \$50 Week representing Clow's Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Clow Company, Desk 31, Philadelphia, Pa.

YOU can letter Automobiles, Doors, Trunks etc., without any previous experience by Transfer Process. Make \$25.00 on \$2.00 Outfit. Auto Monogram Supply Co., 18 Green St., Newark, N. J.

BEST Proposition on Earth. Kitchen Specialty Every Woman Wants. Nothing like it in existence. 200% profit. Best Novelty Mfg. Co., Dept. C, 180 N. Wells, Chicago.

We Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., 201 Oliver, St. Louis.

AGENTS and portrait men. Crew managers. We give you more for your money. Better and quicker service. Lowest prices on frames and glass. Referrals credited. Catalog free. The Pioneer Corporation, 1259-A West 83rd St., Chicago.

WANTED—Tailoring Sales Agent. Make big money from very start—\$20.00 to \$75.00 weekly. Largest made-to-measure tailoring house, furnishing an equipment of one hundred woolsens, wants you to take orders. Satisfaction guaranteed. Biggest merchants in many towns have started with our line. If you want to establish yourself permanently in business and make big money write for full particulars, giving your experience as salesman or tailor's sales agent. H. F. Foster, Sales Manager, Lock Box 488, Chicago.

MOST Wonderful Seller. 96c profit every dollar. No stock to carry. License unnecessary. Sample free. Mission Head Co., 1617 Irvin, Los Angeles, Calif.

AGENTS—Best seller: Jim Rubber Repairs for tires and tubes; supercedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, and is guaranteed to last the life of the tire or tube. Sells to every auto owner and accessory dealer. For particulars, how to make big money and free sample, address American Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 608.

AGENTS—If you are making less than \$300 a month our proposition on Sentinel Burglar Alarms for windows and doors will interest you. Many agents earn \$20 daily. Brand new inventions. No wires, batteries or nails. Instantly attached to any door or window. Handsomely nickel plated. Sell on sight. No competition. Provides cheap burglar insurance. Big money makers. Write today for extremely liberal terms to agents. Sentinel Alarm Co., 140 S. Dearborn St., Chicago, Ill.

AGENTS—Stamping names on Pocket Key Protectors; sample Check with your name and address, 25c. Stamping outfit, Biolumen Checks, Check Books, Name Plates. Hart Mfg. Co., Desk 2, 343 Dugraw St., Brooklyn, N. Y.

YOU can be your own boss with our Key Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address. 20 cents. Pease Die Works, Dept. M, Winchester, N. H.

PATENTS—Write for our free illustrated guide book and evidence of conception blank. Send sketch or model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 103 Ninth, Washington, D. C.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Referrals credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

BIG money and fast sales. Every owner buys Gold Initials for his auto. You charge \$1.00; make \$1.25. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

DICHLINOL CD(C(=O)OC)C(=O)SCl. It's a Chemical. Miller. The Chemist supplies latest Manufacturers' Formulas for Food, Beverage, Household, Automobile, Sanitary Specialties in all lines. Grae-ols New Beverage with the Kick. Stamp brings lists. Valuable Information to start a business paying fifty to five hundred dollars weekly with small investment. Miller, Chemist, Tampa, Florida.

AGENTS: Big profits, best and cheapest swallow letters made. Easily applied. Dime brings free samples. Particulars free. Schabine Co., 1115 Second Ave., New York.

MAKE \$2 an hour. Article that removes iron rust, grass, medicine, fruit, milkew stains. Cleans Panama and Straw Hats. Washes clothes. Sells every home. Write for free demonstrating outfit and start taking orders at once. Christy, 81A Union, New-York, N. Y.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

AGENTS: Make a dollar an hour. Sell Menstru, a patent patch for instantly mending leaks in oil utensils. Sample package free. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

AGENTS: Make \$75.00 a week selling our strictly All-Wool made-to-measure suits at \$26.50. You collect profits in advance and keep them. We supply these selling outfit in America. Many exclusive money-making features. Tailoring, tailcoat and side-line men, part or full time, set in touch with us immediately. Address Dept. 65, Goodwear, Inc., 342 W. Adams St., Chicago.

0.033 Ex-Cel Luminous Crucible shines brilliantly in the dark. Chairlegs, lampshades and individuals are only waiting for a demonstration before buying. Agents make handsome profits. W. G. Hannan Co., Dept. B, 57 E. 18th St., Chicago.

HIGH-GRADE SALESMEN WANTED

MAKE \$50 to \$100 per week selling dryer to washer our \$20, \$24, \$28 line of Visco wool made-to-measure Bulbs and Top Coats. You get your profit the minute sale is closed; experience not necessary. We teach you how and furnish everything to do business with; no extra charges for double-bagged or fancy coats, extra sizes or skeleton linings. House of Campbell, Campbell Building, 450 South State St., Chicago, Ill.

WANTED—Salesmen experienced in selling books, aluminum, magazines, portraits, office specialties, chautauqua drags and household labor-saving devices. Business expansion creates openings for 200 well-qualified men. Write today for "The North Ridge Way to Fortune Pay." Give age, education and experience. North Ridge Brush Company, Chicago Avenue, Freeport, Ill.

MAKE \$2.75 profit every sale to car owner. Dealers readily sold in quantities proportionately larger profit. Excellent side line for man with car already covering automobile trade; commission basis. Other men making big money—why not you? Morgan Caravans Co., 934-945 W. Washington Blvd., Chicago.

ONLY one policy a day means \$120 per month profit; same on renewals. Policy pays 25,000 death; \$25 weekly benefit for injury or sickness. Premium \$10 yearly. Full or square claim. Easy seller. Write quick for territory. Underwriters, Dept. R-29, Newark, N. J.

MAKE \$8.00 to \$10.00 per day selling Bradford Universal Signal to car owners. Combined signal parking light and road mirror. Quickly demonstrated, a proven seller. Earn \$4.00 commission on \$12.00 sale. Write Jones Automotive Supply Company, 1403 Hennepin, Minneapolis, Minn.

SALESMEN Wanted in Every Town in the United States to Sell a New Guarantee Fountain Pen. Makes \$10 to \$12 a Day. Send 5¢ for Sample and Particulars, to V. Loughlin, 6817 So. Halsted St., Chicago, Ill.

SALESMAN. If you want \$8,000 this year write us. Strong line for retail stores. Nationally advertised. Liberal weekly advance to producers. W. Morgan, Mgr., 1829 Euclid, Cleveland, Ohio, Dept. 200.

SALESMEN to sell to Auto and Electric Supply concerns a complete line of replacement Ignition Wires for Ford Cars. Sold on commission basis. Address, Grossman Auto Parts Co., White Plains, N. Y.

LEATHER Advertising Specialties, highest quality, lowest prices. Every kind and merchant to prospective buyer. High commissions. Write now to Eastern Leather Specialty Co., 220 Lafayette St., New York, N. Y.

SIX live patented auto accessories. Oil Gauge, Windshield Cleaners, Hose Clamp, etc. No investment. Big commissions. Address Sales Mgr., 22 Sta. C, Omaha, Nebr.

SELL Holmes Tires and Tubes. No capital required. Fine weekly income. Price sells them, quality gets returns. Holmes Rubber Co., 1500 W. 15th, Dept. F, Chicago.

SALESMEN wanted for men's shoes sold direct from factory to wearers. Commission one dollar per pair. K-W Shoe Company, Bowler Building, Chicago, Ill.

GO TO \$15 daily introducing new style guaranteed hosiery; must wear or replace free; no capital or experience required; just show samples, write orders. Your pay in advance; we deliver and collect; elegant outfit furnished; all colors and grades, including silk. May-O-Chic Mills Co., Desk 1065, Cincinnati, Ohio.

SELL our men's tailored to measure \$23.50 suits and "Shedrain Dressay Top Coat" direct to wearer. This low price makes numerous sales and big commissions certain. Commissions paid daily. Special Proposition to men writing immediately. Style-Center, Cincinnati.

\$10 money selling "Delta" Replacement Parts for Ford Cars to dealers. Product standard. Exclusive territory. Also complete line Radio equipment ready soon. Give references. Delta Products Co., Krebs Bldg., Detroit.

SALESMEN—Sell Zim's Peerless Collection System (106 letters). Professional and business men need it. Has special, exclusive features. Suits \$7.50. Costs you \$2.00. Creditors' Association, 312 McKnight Bldg., Minneapolis, Minn.

SALESMEN, Agents, County Distributors—Sell Schaefer Oilwatch. Must positive selling for Ford Cars on market. Good commissions. Protected territory. Philip Schaefer & Co., 20 East Jackson Blvd., Chicago.

SIX live Patented auto accessories: Oil gauge, windshield cleaners, hose clamp, etc. No investment. Big commissions. Address Sales Mgr., 32, Sta. C, Omaha, Nebr.

JOIN hands with Foster and Success. Twenty quick and easy sales daily will make you over One Thousand Dollars monthly. Present men are doing better than this. Sells to dealers. No advertising. District and State Managers can make Thirty Thousand Dollars yearly. Salesmen, eleven new agents, general agents, crew managers and sales agencies, write or wire for particulars. If you want quick action send \$2.00 for \$2.00 sample. Money back if you want it. Address Foster Laboratories, Dept. 295-P, Elkhorn, Wis.

SALESMEN who travel in Ford cars— Sell the Dual Front Spring System for Fords, a line that has no equal nor competition. Eliminates the front toe-in. Double front springs and a pair of Shock Absorbers gives the Ford the stability and finished appearance of a high-priced car. Write for plan; will not interfere with your present line. Evans-Cooke Mfg. Corp., 2320 Fairmount Ave., Philadelphia, Pa.

SALESMEN; Sell State pocket maps showing auto roads, to advertisers and dealers. Easy to sell. Get our splendid offer. Standard Map Company, 127 W. Ohio St., Chicago.

AGENTS sell Peck's Soft Metal Blanks for mounting any kind pots or pans. 100% profit. Sample free. E. E. Peck Co., Dept. A, Medina, N. Y.

BEST Seller; Jim Rubber Repairs for tires and tubes; supercedes vulcanization at saving of over 800%; put it on cold, vulcanizes itself in two minutes, guaranteed to last life of tire or tube; sells to every auto tire and accessory dealer. Get particulars how to make big money and free sample. American Rubber Co., Philadelphia, Pa., Dept. 310.

SELF-ADJUSTING Robert Wrench, most wonderful wrench on market. Grasps pipes, nuts, bolts. Sells for \$1.85. You make \$90 on each. Sample \$2. Write Robert Wrench Co., 71-C Murray St., New York.

DISTRICT Sales Managers and Salesmen. Get our proposition selling men's high-grade shoes direct from manufacturer. No collections or deliveries. Commissions daily. Dept. 16, Quick Shoe Co., Brockton, Mass.

SOMETHING New, a necessity. All business and professional men need H-Sells \$7.50, costs you \$2.50. Big repeater. Sample free. Merchants Assn., Minneapolis, Minn.

SPECIALTY Salesmen here's your chance. Want it? Nifty, clever Little Contract Washer cleanses autos quickly. Attaches to Garden Hose. All Brass—can't rust. Won't mar paint finish. Every car owner a customer. Two Styles No. 1-\$2.50, No. 2-\$1.75. Handsome Profit. Dept. P. Contract Auto Washer Co., Topeka, Kansas.

ASKO—Salesmen to sell Auto Acc. as side line; can carry sample in vest pocket; sells on sight. Big bonus. Write for sample. Allen Specialty Co., 2721 West Lake St., Chicago.

"**DISPOSITIVE**," aluminum hip suspenders, etc. Shirt down, pants up. Enormous seller. Woods, 501 North Seventh, St. Louis.

HELL Advertising Penlets. Big Commissions. Quik Sellers. Write for Propos. without. Keystone Penlet Works, Abiquiu, N.M.

SPECIALTY Salesmen calling on Garment and Accessory Dealers, to handle side line, "Old King" Plate and Compagnon Rings. Dugay & Stevens, Chamber of Commerce Building, Los Angeles, California.

57 MILES per gallon made with new patented gasoline Vaporizer. Write for particulars. Vaporizer Co., Pakwana, S. Dak.

EVERYBODY buys Every Day. You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee, and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no rent to pay; no money invested; take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "workers." Address Hirschbeck-Hill Co., Dept. 200, Chicago, Ill. Reference: A.O. Bank or Express Co.

SALESMEN can make \$5.00 a day selling our Calendars, Fans, Pencils, Signs, Advertising Novelties, Yard Sticks, Whistles, etc. Liberal terms. Sells entire year. Fine side lines. Local and travelling agencies. Model Calendar Company, Dept. 220, South Bond, Ind.

\$300 PER month and bonus guaranteed salesmen successfully demonstrating wonderful new adding machine. Details \$15.00. Work equals \$350 machine. Genuine opportunity. Full time or side-line. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

AGENTS—\$600-\$200 a week. Free samples. Gold sign letters anyone can put on auto windows. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

LIVE Wire Distributors and Dealers everywhere make money selling Seni-Past inner-tube repair kits because of the unequalled efficiency and our aggressive and helpful sales promotion and advertising cooperation. Write Sales Manager for particulars. Robert M. Bowes Co., Indianapolis, Ind.

HELP WANTED

DISTRICT Managers—Big Profit! Men capable of organizing and managing crews of lady solicitors can easily earn \$100 to \$200 per week with the B. & G. Protector, the original and best Protector on the market. Every woman between fifteen and fifty needs and buys it. Two grades, Flesh or White. B. & G. Rubber Co., 618 Penn Avenue, Dept. 147, Pittsburgh, Pa.

DISTRICT Manager: 150,000 sales of a household appliance in New England have paid District Managers upwards of \$3,000 yearly. We are ready to expand. Offer work entire or side line. The Heeres Co., 64 Broad Street, Milford, Conn.

SIGN Letter Agents and Painters: \$600 Profit. Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big Demand. Free Samples. Metallic Letter Co., 431D N. Clark St., Chicago.

CLERKS—Young men, women, over 17, desiring government positions, \$125 monthly; write for free list of positions now open. Raymond Terry (former Civil Service Examiner), 1504 Continental Bldg., Washington, D. C.

FIREMEN, Brakemen, Baggage-men, Electric Motormen, Conductors, Sleeping Car and Train Porters (colored). Railroads everywhere \$140-\$200. \$10 Railway Bureau, East St., Louis, Ill.

FINGER Print Lesson based on Henry System included with Detective Course. Particulars free. Write American System, 1965 Broadway, New York.

DISTRIBUTORS, District Salesmen, Managers, Agents. Do you know that we make the best Waterproofer Aprons and Sanitary Specialties on the market? Sell for less, and your profits are largest. Write now and examine yourself. B. G. Rubber Mfg. Co., 618 Penn Ave., Dept. 148, Pittsburgh, Pa.

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Continued from Page 50

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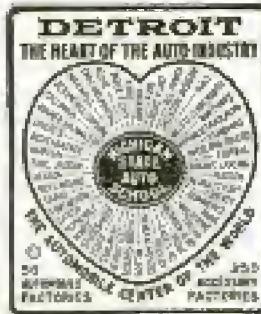


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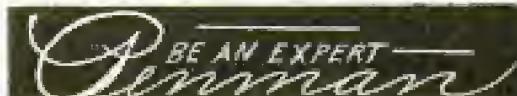
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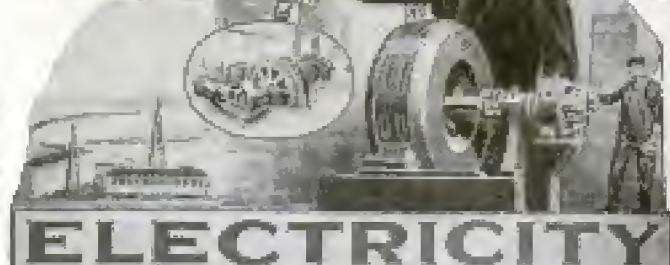
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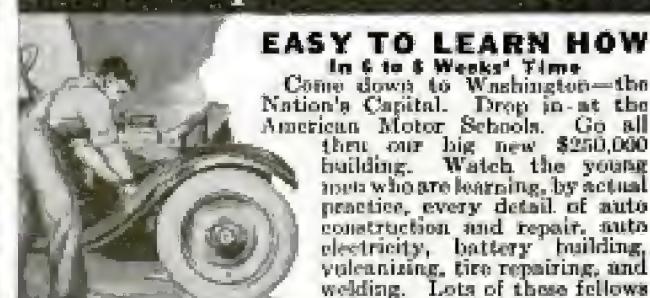
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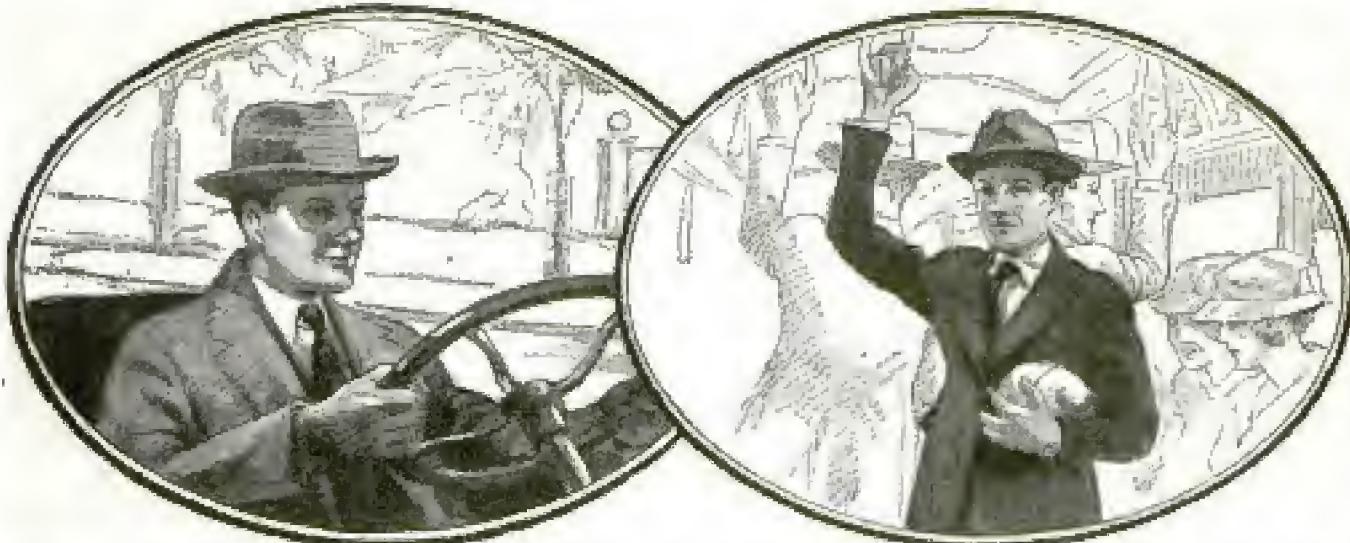
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Winning victories is a matter of morale, of consciousness, of mind. Would you bring into your life, more money, get the money consciousness, more power, get the power consciousness, more health, get the health consciousness, more happiness, get the happiness consciousness? Live the spirit of these things until they become yours by right. It will then become impossible to keep them from you. The things of the world are fluid to a power within man by which he rules them.

You need not acquire this power. You already have it. But you want to understand it; you want to use it; you want to control it; you want to impregnate yourself with it; so that you can go forward and carry the world before you.

And what is this world that you would carry before you? It is no dead pile of stones and timber; it is a living thing! It is made up of the beating hearts of humanity and the indescribable harmony of the myriad souls of men, now strong and impregnable, anon weak and vacillating.

It is evident that it requires understanding to work with material of this description; it is not work for the ordinary builder.

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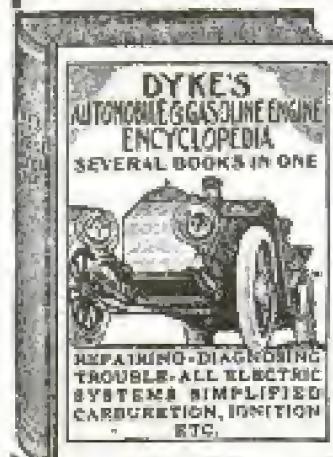
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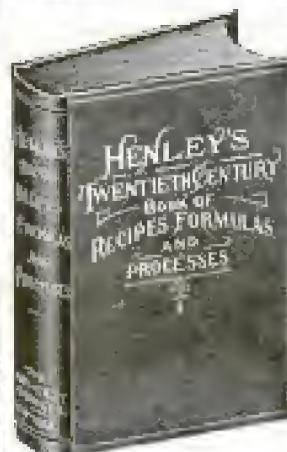
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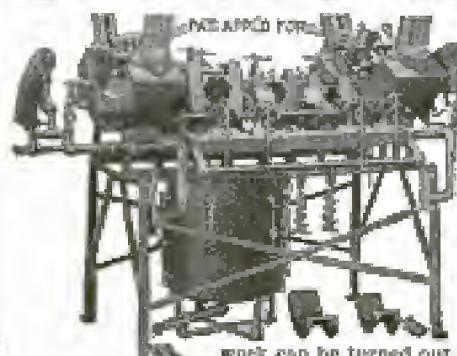
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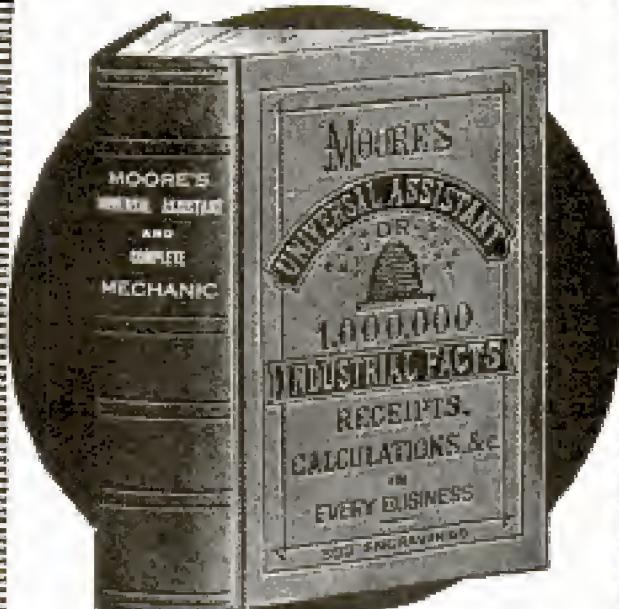


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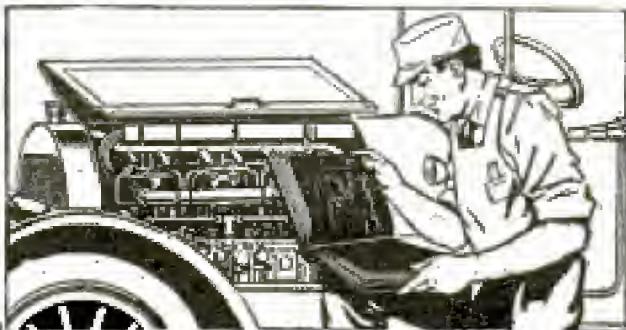
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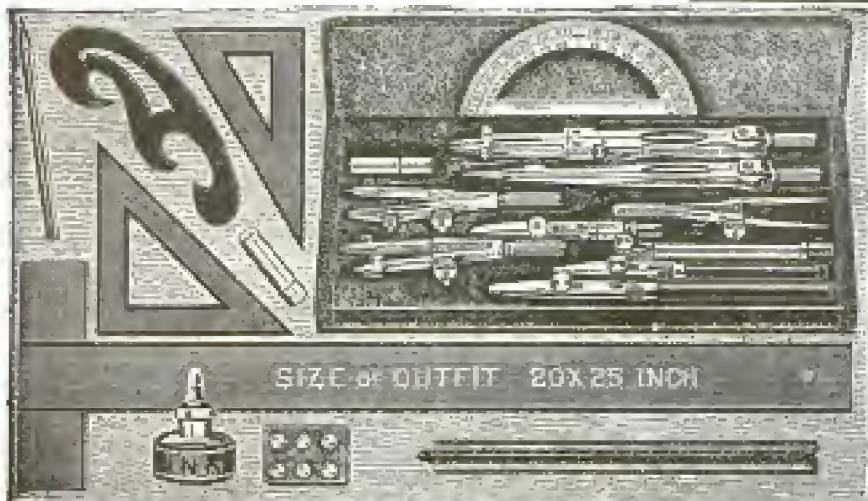
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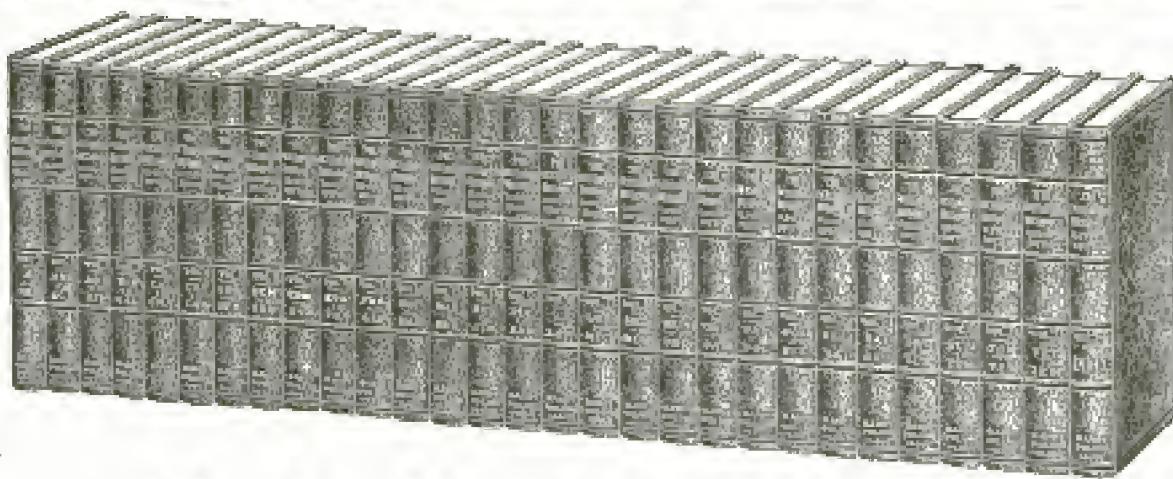
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But there's more of an answer to the question. A man puts bookshelves in his home or buys bookcases because he knows that either are as necessary in his home as pantry shelves or closet shelves. He knows that books are as vital a necessity to every man and his home as his food and his clothes and medicine.

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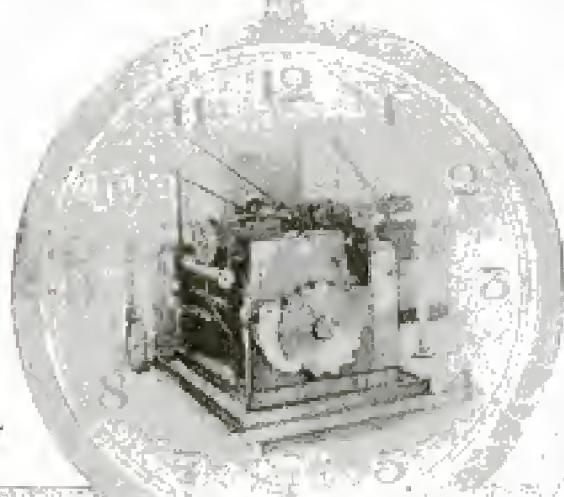
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Popular Mechanics Magazine

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Vol. 37

MAY, 1922

No. 5

Astonishing Results of Foundation Tests

85⁴/₅

By HENRY S. WHITE

VERY interesting results have been obtained from the unique tests of the foundation piers and caissons for the new Union Station at Chicago, that were fully described and illustrated in the January issue of this magazine. Since that time the tests have been completed on both piers. On the one with the belled base, having a bearing area of $54\frac{1}{2}$ sq. ft., a load of 970 tons was ap-

sition of the concrete. Thus the remarkable result is shown of a load that was over 13 times the load allowed by the city of Chicago ordinance, with a total settlement at the base of only $1\frac{1}{16}$ inches.

The next test helped to explain this unexpected result, for it proved positively that fully a quarter of the load was car-



Bottom of Tunnel to Unsupported Base of Foundation Pier: Bottom of Pier, at the Man's Hand, has been Pushed Down from Top of Tunnel by Load of 260 Tons.

plied for 10 days continuously, resulting in a total settlement of $1\frac{1}{8}$ in., of which $\frac{1}{2}$ in. was found to be due to the compression of the concrete itself. On the other pier, without a belled base, and with a bottom area of $12\frac{1}{2}$ sq. ft., a load of 1,000 tons was applied continuously for six weeks, with a total settlement of 2 in., of which $\frac{7}{16}$ in. was due to the compres-

tion of the concrete. Thus the remarkable result is shown of a load that was over 13 times the load allowed by the city of Chicago ordinance, with a total settlement at the base of only $1\frac{1}{16}$ inches.

The next test helped to explain this unexpected result, for it proved positively that fully a quarter of the load was car-

tied by the skin friction between the outside surface of the pier and the soil sur-

rounding it. A shaft, 4 ft. in diameter, was sunk alongside the pier with the belled base to the bottom of it, and a tunnel, 6 ft. in diameter and 45 ft. long, was driven to the bottom of the other pier. The shaft alongside the first pier furnished opportunity for a thorough examination of the soil, which was found to be partly soft, and partly hard clay and gravel. Under the other pier the hardpan was all dug away, leaving the base entirely unsupported. Loads were then applied, and gradually increased until a load of 260 tons was reached, when for

the first time the unsupported pier began to move. When the pier had been pushed down about 3 ft., the load was taken off. This proves that the resistance from skin friction alone was at least 250 tons, showing by calculation that there was resistance from friction at the rate of 570 lb. per square foot of the pier's surface. This is the first time a test of this kind has been made, and the results are deemed to be of great value. It is hoped by engineers that these demonstrations will convince the city authorities that the present allowable load could safely be doubled.

8521 NEW PROCESS MAKES COTTON FIREPROOF

Invention
BALED cotton, which so easily catches fire, or quickly rots when exposed to the weather, is to be largely saved from both huge losses by a new chemical process which is simple to apply at the time the cotton is ginned and does not injure the quality of the cotton.

Anyone who has touched a match to a piece of cotton batten knows how the flame spreads over the surface in a flash. This has led to the adoption of the term "flash fire" in the cotton industry, and is one of the menaces to be guarded against in shipping or storing cotton bales. Another form of fire risk is the so-called "burrowing fire," which refers to the fire which eats its way into the bale. One would think that this fire hazard was a sufficient handicap to be placed upon any industry, but cotton is also subject to another loss, called "country damage," caused by fermentation among the fibers when the bales are stored in contact with the ground or under adverse weather conditions. This country damage spreads into the bale, and may occasion the loss of as much as 80 per cent of the cotton in the bale.

When consideration is given the fact that, with the single exception of corn, cotton is the most valuable of our agricultural products, and far exceeds in value any other exported commodity, the economic importance of any process that will reduce the fire loss and prevent the loss through country damage, can be appreciated.

The process of treatment is extremely simple and has been tested to a point where its commercial value is proved. In treating the gin-baled cotton it is only necessary to roll the bale through an L-shaped vat containing the chemical in such a way that all surfaces are exposed to the liquid. The level of the liquid in

the vat is maintained by a float valve controlling the supply from a storage tank. At least two minutes must be consumed in passing the bale through the vat in order to insure a proper penetration of the chemical solution. When it comes from the vat, the bale is placed on a platform and allowed to drain for two or three days, when it is ready for shipment or storage.

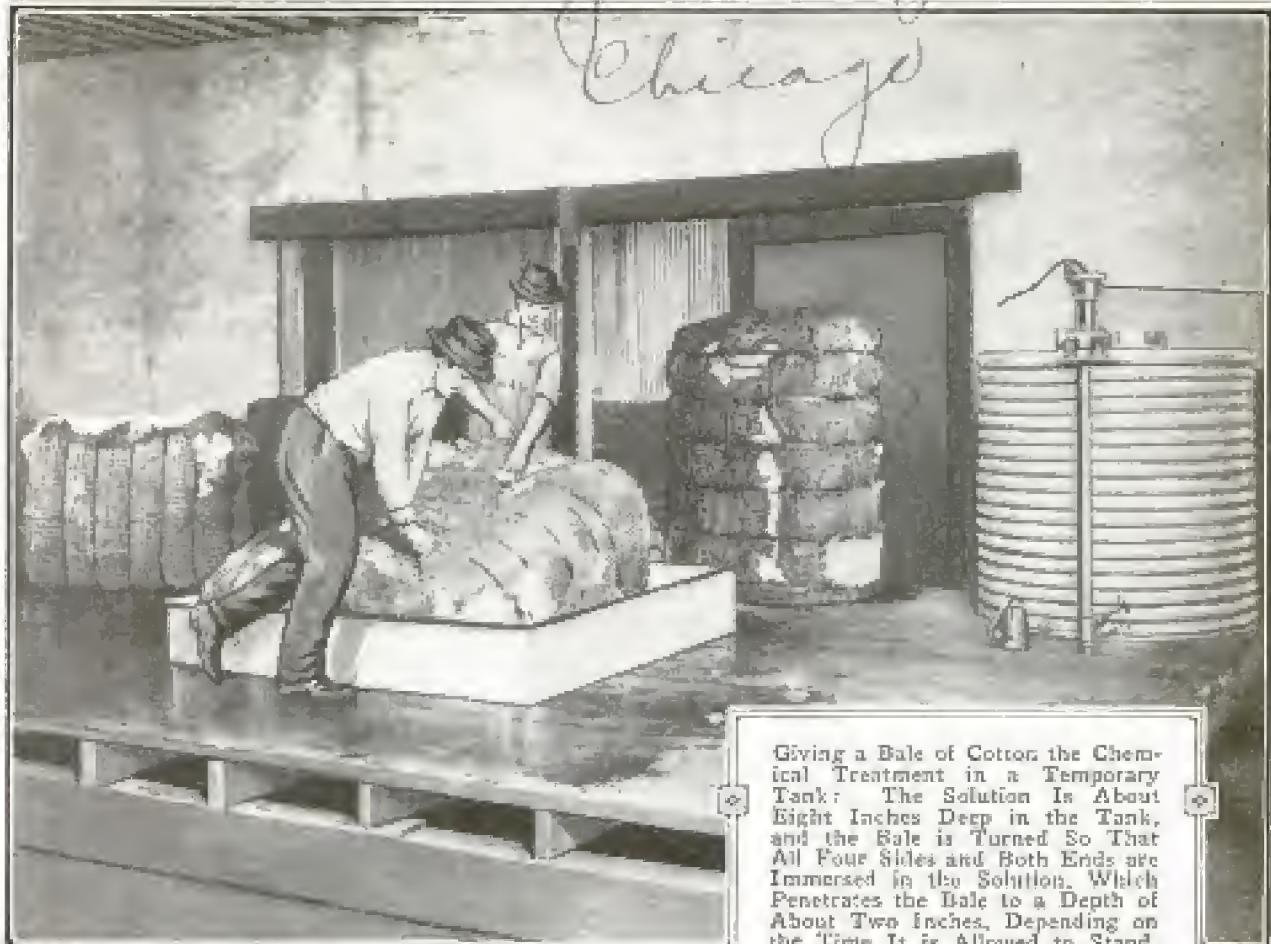
Fire tests on the treated bales show that matches and cigar or cigarette stubs may scorch the surface, or even start local flash fires in some cases, but that, as a general rule, these die out quickly without starting burrowing fires. In the exceptional cases where burrowing fires started, they were easily quenched with water. In one particularly rigid test, the flame from a blowtorch was passed over the surface of a treated bale, and while the surface was scorched, no flash fire or burrowing fire was started.

In addition, several tests showed that treated bales were practically fire-resistant to sparks such as would come from a coal-burning locomotive. This fact alone is of great importance, not only to the cotton industry but to the railroads which transport the crop, for it means that cotton may be shipped on flat cars or in ordinary cars without special precautions being taken, as is now the case. As a consequence, the first-grade spark-proof cars can be released for the movement of other crops.

Many tests have shown that treated bales are practically immune from country damage, even when stored under adverse weather conditions. One test showed that the loss after three years was only 2 lb. on a 500-lb. bale, while with the untreated bales the loss in only a few months may range from 80 lb. to as much as 400 lb. per bale.

8521 International Cotton
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Giving a Bale of Cotton the Chemical Treatment in a Temporary Tank: The Solution Is About Eight Inches Deep in the Tank, and the Bale is Turned So That All Four Sides and Both Ends are Immersed in the Solution, Which Penetrates the Bale to a Depth of About Two Inches, Depending on the Time It is Allowed to Stand. It Takes About Two Minutes to Apply the Treatment



Testing the Fireproof Quality of a Treated Bale of Cotton by Passing the Flame from a Blowtorch over the Surface: The Chemical Treatment Rendered the Bale Fireproof to Such an Extent That Even This Hot Flame did Not Start Any Flash Fires, or Burning Fires; but the Flame from the Torch was Not Allowed to Strike One Spot for Any Length of Time.

8618 Col. H. L. Thompson,
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This New Bridge over the Connecticut River at Springfield Is of Modern Steel and Stone Construction and will Take the Place of the Old Bridge to the Right Which has been Considered as Unsafe for Traffic after having Been in Use, with Few Interruptions, for a Period of 105 Years.

NEW VIADUCT REPLACES OLD TOLL BRIDGE

A new bridge is being erected over the Connecticut River at Springfield, Mass., to take the place of the old toll bridge which has been in service since 1816 and is now declared unsafe for traffic. The old bridge is of the two-way, covered type and was constructed of hand-hewn oak timbers held together by hand-wrought iron rods and hardwood pegs. The new bridge is of modern steel and stone construction, and will be 80 ft. wide to allow for car tracks, vehicular and pedestrian traffic. One feature of this bridge is the center span of 172 ft., which is so constructed that it can be replaced by a drawbridge should the river be made navigable for ocean-going boats later.

8623

NEW SUBSTANCE AS CATALYST HARDENS OILS

The process of oil hardening, called hydrogenation, consists in the conversion of oils, which at ordinary temperatures are liquid, into fats which are hard under the same conditions, and depends on the use of a catalyst, which is a substance causing the action but not affected by it. It has been found that a combination of nickel-magnesium silicate gives much better results than any of the catalysts previously used.

Franklin & Institute Journal
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3/1922



German Substitute Manikins, Made of Metal Instead of Wax: At Left is Shown a Seated Manikin Undraped; to the Right of It, Draped. To the Extreme Right Is a Standing One, and to the Left of It, the Same Manikin Draped. The Manikins Revolve on Balls at Their Feet

GERMANS INTRODUCE MANIKINS OF METAL INSTEAD OF WAX

During the war almost every staple in Germany was replaced by an "ersatz"—a substitute—and now it seems that also in peace time certain substitutes have come into use. One notable instance, that is said to be for the purpose of counteracting French influence, is the substitution of metal manikins for the beautiful wax ones so universal, not only in France, but throughout the whole world of fashion. These lay figures are the invention of a famous German sculptor and are made of such light metal that they can easily be carried about. The arms are jointed, and the whole figure rests on a ball upon which it will revolve.

TWENTY-PASSENGER AUTO BUS IS SPECIALLY DESIGNED

A new passenger-carrying bus, now undergoing its preliminary trials, has been specially designed for this service. The running boards and floor are placed low for convenience in entering and leaving. Sidesway is eliminated to a great extent by the increased width of the tread, which is 68 in. as against the usual 56 in. The bus is equipped with a 64-hp. motor provided with a governor, and is capable of a maximum speed of 52 miles an hour. The interior appointments have been specially designed for the comfort and convenience of the passengers. The motor and driveshaft are supported on fabric or rubber pads to eliminate vibration.



Left: "The Silver Fox" is Specially Designed for Passenger Service and has the Floor and Running Boards Placed Remarkably Low for the Convenience of Travelers. Above: The Extra-Wide Tread Makes for Easy Riding and Reduces Side-way

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MECHANICS

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861 VISUALIZE PAPER'S STRENGTH
BY NOVEL DEMONSTRATION

A rather unusual method was recently employed to demonstrate the strength of a certain kind of paper. A single sheet



The Single Sheet of Paper is Supporting a Weight of 769 Pounds.
The Young Women Seem to Have Perfect Confidence
in Its Ability to Hold

of this paper, no heavier than the usual letter stock, was suspended in a frame carrying a seat on which five young women stood and sat. The total weight supported was 769 lb., which included the weight of the platform.

FIGHTING WHEAT-FIELD FIRES

866 IN EASTERN WASHINGTON

In eastern Washington is an agricultural region, known as the Palouse Country, that is devoted almost entirely to wheat raising. Here one may ride mile after mile through what has been aptly termed, by one writer of fiction, a "desert of wheat." After the crop has been successfully nursed through dry winters, wet springs, and dry summers, comes the time of ripening grain and its danger from fire. When the wheat is about ready to harvest, a fire started in it will spread

almost instantly, like a prairie fire. Thousands of dollars are lost each year from this cause alone. The causes of the fires are various, many of them being incendiary.

So vital is the success of the wheat crop to the welfare of the region that the business men of Colfax, which is located in the heart of the wheat belt, have organized a volunteer fire department to aid the ranchers in saving their crop. The method used by the ranchers is the same as that employed by the earlier settlers in protecting their homes against prairie fires—a plowed strip ahead of the fire. Also a call for help is telephoned to town.

In town, a special signal is sounded on the fire whistle, and autos and volunteer fire fighters flock to the fire station. A pile of gunny sacks that is kept at the station, is soaked with a stream from the hose. The first auto to arrive is given a load of shovels and these wet sacks. Following autos are loaded with men, and they leave in rapid succession for the fire. Usually, by the time help from town arrives, the rancher and his neighbors have the plowed fire line completed and are ready for the men with the wet sacks. The sacks are used to beat out any small fires that start on the opposite side of the plowed strip.

So common are wheat fires during the harvest season that as many as five or six alarms may be turned in during one day.

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SKINNING KNIFE FOR HUNTER
PREVENTS CUTTING HIDE

Hunters, or other persons who have occasion to skin wild or domestic animals, will appreciate a new knife invented by an eastern man. The knife has a blade with a sharply curved tip which terminates in an oblong knob. Both edges of the blade are sharpened, and in using, the knob is first inserted between the hide and the flesh. In this position, the knife may be either drawn or pushed without fear of cutting deeper than intended, and without raising the skin with the fingers.



Drawn Aug 20 1914
G. G. Upton, N.Y.

WILL THE LOST TRIBES RETURN TO JERUSALEM?

By Lewis R Freeman

*Editor, California
& Pasadena City*



Characteristic View of the French-Built Railroad, near Homs, in Northern Syria, between Reyak and Aleppo: The Road Is an Almost Continuous Succession of Curves and Pillars, Owing to the Peculiar Conformation of the Country

OUT of the "Grapes of Wrath," trodden in the wine vat of the World War, have flowed strange vintages, most of them bitter if not poisonous. One of the few that sparkles with the bright effervescence of promise is that which typifies the release from their centuries of Turkish bondage of the Jews, Armenians, and Arabs, to say nothing of various and sundry odds and ends of lesser peoples who had long suffered virtual strangulation in the grip of the tentacles of the

dying Ottoman octopus. The difficulty of extending succor to the young Armenian republic may mean that it will yet have to face for many years the threat of Turk and Bolshevik; but for the Jews of Palestine—with a strong but liberal British protectorate established, and ultimate autonomy in sight—there is hardly a cloud on the horizon.

And for those who were once called "God's Chosen" the vintage of the war has brought more than freedom—it has



A Group of Pre-War Jewish Colonists in Palestine: They Were, as a Rule, Very Poor and Their Equipment Primitive in the Extreme. Undoubtedly the New Colonization Scheme will Alter All This

brought fulfillment. To the ends of the world Jews are thumbing the pages of Isaiah, Jeremiah, and others once of scant honor in their own country, pointing out how prophecies already come true have opened the way for the fulfillment of others of even greater import, leading up to a virtual renaissance of the race and the establishment of their long-dreamed-of New Jerusalem. I shall discuss here only that covered by two verses from Isaiah. Because the war has made the "highways" referred to a *fait accompli*, that prophecy, with all that its fulfillment



A Section of the Bagdad Railway in Northern Syria: This was Built by the Germans before and during the War, as a Part of Their Ambitious Plan of Connecting Berlin by a Direct Railroad with the Head of the Persian Gulf

seems likely to lead up to, falls fully within the field of a magazine which devotes itself exclusively to accomplished, and accomplishable, facts. Visioning the return of the "Lost Tribes" of Israel, Isaiah wrote (xi:16):

"And there shall be an highway for the remnant of his people, which shall be left, from Assyria; like as it was to Israel in the day that he came up out of the land of Egypt."

And again (xix:23):

"In that day shall there be a highway out of Egypt to Assyria, and the Assyrian shall come into Egypt, and the Egyptian into Assyria, and the Egyptians shall serve with the Assyrians."

Just what a highway connoted to Isaiah, it would be interesting to know. Doubtless, however, clear-seeing as was the great prophet of the redemption, it is not probable that he visualized much more than a long series of wells and

tanks, khans, and caravansaries, marking the windings of a dusty camel and ass-beaten path across the desert. Certainly, not in the farthest-flung vista of his vision could he have seen the glistening tracks, the thundering trains, the crowded station yards that differentiate the modern railway and railway travel from that by the ancient caravan. And yet it is in the railway that the prophecy comes to fulfillment. From thousands of miles beyond the outermost limits of the known world of Isaiah's time it is now possible to reach Jerusalem by rail. The

highway from Egypt to Assyria, via Palestine, is an accomplished fact; but that (save as it fulfills the letter of the prophecy) seems hardly more than a negligible incidental when one learns that the whole of the European railway system, together with great and increasing lengths of those of Africa and Asia, have been brought—almost overnight as it were—in rail connection with Jerusalem. No matter whether, on any one of these three continents, the most restless remnant of any of the lost tribes has wandered, there are few who would have to march for

more than a day or two to reach a highway that will lead them back to Israel. To what extent they will bring about the fulfillment of other prophecies by returning, still remains to be seen.

Just how much the war and the pressing transportation needs of the belligerents put forward the establishment of through rail connection between Jerusalem and the world to the east and west and south, it is hard to say. Even had the war not come, so that Palestine and Syria would have remained under Turkish control, it is still conceivable that a roundabout connection with the Bagdad Railway would have been effected in the course of the next eight or ten years. Nevertheless, the facts that the Palestine and Syrian lines were French, though of different gauges, and that the Damascus-Medina line was Turkish, and the Bagdad line German, would have made co-operation to this end very problematical. Still one heard such a connection spoken of frequently in Palestine in the years just



General Map of Palestine, Syria, and Mesopotamia, and Adjacent Territories, Giving an Idea of the Extent to Which the Railways are Developed at Present. It will be Seen That Even Now the Old Prophecy of a "Highway Out of Egypt to Assyria" Is Practically Fulfilled.

previous to the war, and perhaps it would eventually have come to pass. A railroad across the barren Sinai Desert to the delta of the Nile, however, I never heard discussed at that time, either in Palestine or Egypt. As the insignificant trade between these two regions was easily handled by the existing steamer service, it is probable that many years would have gone by before Turkey, or even private concessionaires, would have been willing to sink money in what could hardly have been a profitable enterprise. Had not this railway been built as a strategic line then, it seems likely that there could have been no incentive for its construction until Palestine and Syria had fallen from the palsied hand of the "Sick Man" by their own weight. Without the war, this might not have eventuated for several decades. I shall hardly need to add that there is no possibility of the Jews ever having come to their own while Palestine remained under Ottoman control.

A brief survey of the railway situation in Turkey-in-Asia at the outbreak of the war will be necessary to an understanding of what was accomplished during the war, and a consideration of the possibilities this latter development opens up for the age-long Jewish dream of a New Israel in a restored Palestine.

By the middle of 1914, the Bagdad Railway (under construction by German concessionaires as the backbone of their grandiose plan of eastward penetration)

was, save for a number of heavy cuts and tunnels in the Taurus and Amanus mountains, complete from the Bosphorus to the Euphrates. The bridge over the latter, at a point not far from Aleppo, was well under way, and some preliminary work had been done on the eastward extension to Mosul, opposite the site of old Nineveh, on the Tigris. At the opposite end of the survey, working with material brought up the Tigris from the Persian Gulf, the grading had been completed from Bagdad to Samara, 60 miles north of the ancient capital of the caliphs.

In Syria a French-constructed and operated railway ran from Beirut, over the Lebanon Mountains to Reyak, from where one branch ran northeasterly to Homs and Aleppo, and another south-easterly, across the Anti-Lebanon Range, to Damascus. From the latter metropolis the German-built but Turkish-operated Hedjaz Railway ran almost due south, across a bleak and sterile desert, to Medina. This line had been built solely with the idea of handling the pilgrim traffic to Mecca, and Turkish mismanagement had brought it to a hopeless state of disrepair within a year of the time the Ottoman government took over the control. A branch of the Hedjaz line ran from the junction of Deraa, down to the Sea of Galilee and the Jordan—well below sea level—and on to the Mediterranean at Haifa.

In Palestine proper the only railway was the 54-miles-long line, owned and operated by a French company, connecting Jaffa and Jerusalem. On account of its open roadstead, Jaffa was useless as a port for days at a time, which fact had set the Turkish government to planning a connection with Haifa by means of a spur from the Hedjaz branch to Jerusalem. As this would have rendered the French line from Jaffa almost worthless, the concessionaires of the latter were much perturbed over the outlook at the time of my last visit to Jerusalem, just before the war.

When I crossed by caravan from Bagdad and Mosul to Aleppo and the Mediterranean in the summer of 1912, evidences of feverish activity were observable all along the survey of the Bagdad Railway. This could have been nothing, however, to what went on after the war began, and especially after the inauguration of the first British drive up the Tigris toward Bagdad. That route immediately became the main—indeed, the only—artery of communication of the Turk-German defense, and remained so until that defense crumbled away to nothing in the last year of the war. The greatest effort was made in pushing the Taurus and Amanus tunnels, as that part of the Bagdad Railway was also the main line of communications for the operations in Palestine and Syria. Through traffic was opened to Aleppo in 1916, about the middle of the year.

Meantime, construction had been pushed on across northern Mesopotamia from the completed bridge over the Euphrates, and by the end of 1916, Nisibin, halfway to Mosul, had been reached. The next year saw the completion of the grade to Mosul, but the tremendous demand for steel in Germany made it impossible to supply material for rails and bridges. Nisibin remained practically the railhead, as far as transportation was concerned, to the end of the war, and I have not

been able to learn that any active construction has been carried on there since. As this is one of the most unsettled regions of the late Turkish empire in Asia, it is not likely that much work will be done here until the combined Turk-Bolshevik threat to Armenia is removed, the Kurds reduced to subjection, and the peoples of this much-harassed section allowed to resume the ways of peace. As Nisibin, however, lies well within the borders of Biblical Assyria, the prophecy of the highway between that country and Israel may be said to have come to fulfillment when the railway was completed to that point.

The materials on hand in Bagdad at the outbreak of the war sufficed only to build a railway from that city to Tekrit,

20 miles north of Samara, and that strange little Arab town—which received its name from Alexander the Great—was railhead at this end when all of southern Mesopotamia was overrun by the British at the culmination of Maude's masterly campaign. Much grading was found to have been done on the survey north to Mosul,

but rails had not been laid. The closing up of the uncompleted gap of the Bagdad Railway need not be a matter of many months, once the country to the north is pacified and the nations concerned (Great Britain and France) in the establishment of a through line from the Mediterranean to the Persian Gulf find the money for the project.

With the French railway from Beirut reaching both Aleppo and Damascus, all the Germans had to do to establish a through line from the Bosporus to Arabia (once the Taurus and Amanus tunnels were completed) was to connect the French and the Hedjaz systems at Damascus, and change the former from a meter gauge to standard. Maan, on the Hedjaz-Railway, was made the base for the early Turkish operations across the Sinai Desert against the Suez Canal, but no new line was laid to assist in this



Section Boss and His Gang on the Hedjaz Railway: The Ties Used Are of Steel, as No Wood Could Stand the Climate. This Railroad Is Turkish-Built, and Mainly Serves the Pilgrim Traffic



The Narrow-Gauge French-Built Line, Climbing the Mountains Back of Damascus: The Grades Are in Some Places Very Steep; Here, for Instance, the Gradient Is Six per Cent, and a Rack System Was Necessary to Secure Traction

ill-advised and ill-fated operation. It was not until it became apparent that the Turks were to be on the defensive rather than the offensive in Palestine, that each belligerent in this theater began work on lines which, when finally united, effected fulfillment of the prophecy of the highway from Egypt to Assyria.

The Germans, after building a line to connect the Haifa branch of the Hedjaz Railway with that from Jerusalem to Jaffa, pushed construction on southward until Beersheba was reached. This was their expiring effort in railway extension in Palestine, and the result of it was that there was a through, if roundabout, line all the way from the Bosphorus to Jerusalem and Beersheba.

When Allenby launched his campaign against the Turks he carried his railway right along with him as he went. It was the sequel to his capture of Beersheba that made possible the welding of the final link in the highway that Isaiah had foretold. Fortunately both lines were standard gauge, so that Allenby's railway

trains were almost upon his heels when he marched into Jerusalem. The final defeat of the Turkish army was so complete that little was done in the way of destroying their railways, and consequently the whistle of the locomotive followed close upon the pursuing cavalry all the way up to Damascus and on to Aleppo. At the latter point Allenby reached the Bagdad Railway.



The "Wailing Place" of the Jews, outside the Old Temple Wall at Jerusalem; The Interior of the Temple had been Converted into a Turkish Mosque, So the Jews could Not Enter

So much for the prophecies that have already been fulfilled. Now what of those which it seems certain are about to come to pass? With Israel once more open to them, and with a highway stretching fair before them, will the Lost Tribes return to realize their New Jerusalem? Of many prophecies in point, one from Jeremiah (xxiii:3) will suffice. In its explicitness of expression it is but typical of what Isaiah, Hosea, Joel, and several other of the prophets, have said on the same subject.

"And I will gather the remnant of my flock out of all countries whither I have driven them, and will bring them again to their folds; and they shall be fruitful and increase."

The Jews are found all over the world at the present day. Speaking very broadly, these may be divided into two classes: the descendants of the tribes which were carried into captivity, or who fled to avoid being carried into captivity; and the descendants of later and more voluntary emigrations. The former movement was in the main toward the east, and occurred previous to 586 B. C., the date of the final destruction of the kingdom of Judah by Nebuchadnezzar; the latter movement has been westward, most of it in the Christian Era. The emigration of European Jews to America is the final wave of this westerly drift.

Students of Biblical history will recall that the union of the twelve Hebrew tribes under the warlike Saul, which was further consolidated under David and Solomon, fell into two parts after the death of the latter. That to the north retained the name of the kingdom of Israel, while that to the south, with its capital in Jerusalem, was called Judah. Israel, after sapping its strength with wars with the princes of Damascus, fell an easy victim to the Assyrians, under Sargon, in 722 B. C. All the inhabitants were carried off to Nineveh, and Assyrian colonists sent to replace them. It was because all trace of the expatriates disappeared that they came to be referred to as the Lost Tribes of Israel.

That the lost tribes were, as history tells us, originally planted in the Tigris-Euphrates Valley is evident even to the veriest tyro of an ethnologist who travels in central Asia today. From the source of the Tigris, near the Black Sea, to its confluence with the Euphrates above the head of the Persian Gulf, the unmistakable Hebraic cast of countenance is encountered in every town and village. In

the larger cities, such as Diarbekr, Mosul, Bagdad, and Busrah, the Jewish quarters are scarcely less extensive than the Musulman. In Mosul and Bagdad, the cities nearest to the respective Assyrian and Babylonian capitals of ancient times, business is today very largely in the hands of men whose ancestry would undoubtedly trace back to captives of Sargon and Nebuchadnezzar. For most of these, it will be but the matter of a short journey by *arabah* [a sort of prairie schooner used in Asia] to reach the beginning of the highway that will take them all the way back to Jerusalem.

How far fragments of the lost tribes wandered eastward will never be definitely known, but unquestionably far into China, if not all the way to the Pacific. One finds Jews in plenty in the bazaars of Kermanshah and Teheran, and right on east across the ancient cradle of civilization from which their Semitic ancestors came. One sees types that are Jewish ethnologically beyond question in the bazaars of Kashgar, Yarkand, and Samarkand, though their religious observances have often been greatly modified by their environment. Farther east still, one finds valleys that are peopled by tribes of unmistakable Jewish origin. In the mountains along the Chinese border they occur only in scattered villages, and by the time one has penetrated 500 miles toward the heart of the Middle Kingdom, the effect of the Jewish immigration is noticeable only in the narrower and more aquiline faces of a type that is predominately Mongol. Another 50 miles and the Hebraic cast of features has become exceptional, and beyond that one rarely sees it at all.

The numerous Jews one encounters all over Siberia were carried there by a resolute wave of the later westward movement from Palestine. They all came from European Russia, not from the eastward movement of the lost tribes. Russian Jews have always made up a considerable part of the pilgrims to Jerusalem. Once communication with what was formerly the Russian empire is restored, the trans-Siberian trunk will open through rail connection for all the Jews between the Baltic and the Pacific, right through to the Holy Land. These will undoubtedly figure largely among the new colonists in Palestine.

The many migratory movements between Palestine and Egypt since the time of the Exodus were responsible for the presence of numerous Jews in northern Africa, though those of the bazaars of



A Typical Station on the Jaffa-Jerusalem Railroad: This Road Is 54 Miles Long, Built by a French Company, and Forms a Part of the "Highway of Prophecy"

Cairo, Algiers, and Morocco are mostly the result of the later westward drift. For a hundred years, however, explorers have been finding so-called "Black Jews" in many parts of the Sahara, upper Egypt, Abyssinia, and even as far south as the Nyasa lakes. The warlike Masai, who graze their herds over a vast area of the high country about the head of the Nile, are strikingly Hebraic in appearance, though it is difficult to trace anything Judaistic in their religious observances. In any event, should any of the Black Jews of any part of Africa desire to return to their mother country, the fact that the highway of prophecy connects in lower Egypt with the almost completed Cape-to-Cairo trunk offers the opportunity to do so cheaply and expeditiously.

The Jews of present-day Europe are largely the descendants of those carried away in the early Greek and Roman conquests, or who migrated during the later Byzantine empire, or through opportunities arising in connection with the Crusades. Most of these have preserved the ancient religious observances, and it is they, therefore, who have been most assiduous in rereading and reinterpreting the prophecies, and in laying plans for the establishment of a New Zion upon the ruins of the old. To these the completion of the highway to Jerusalem has particular significance; for, with all of Europe in rail connection with Constantinople, the fact that the steel rails lead on without a break from the other side of the Bosphorus right to the foot of Mount Zion means that the next step in fulfillment—the return of the remnants of Israel from all the world—may well be

at hand. To one who knows the Palestine of today, the first question that presents itself in connection with the return of any considerable number of the Jewish race is: "Can that dry and barren country support a population greatly in excess of the comparatively sparse one which lives there now?" The answer would be a most emphatic "No," were it not for the fact that the way appears to be open for reclamation which bids fair to make of this desert country another land of Canaan—a land literally flowing with milk and honey. Of the possibilities of restoring Palestine to fruitfulness through general reclamation, and particularly a project for developing power by utilizing the difference in elevation between the Mediterranean and the Dead Sea, I shall write in a later article.

NEVADA LEGISLATURE PASSES LAW FOR CAMEL CONTROL

Camels roaming at will upon the roads and highways of Nevada seems almost like a fairy tale, but the state legislature, in the year of 1875, evidently recognized it to be a most annoying fact. At any rate, at that time a law was passed which prohibited the straying about of these mild-appearing animals that were considered distinctly out of place by the protesting natives, but which had been introduced for hauling purposes at the Virginia City mines. Whether the statute succeeded in safely tethering them is not known, but it is thought that there is no other place in this country that has legislated in this manner against the unassuming camel.

*and A. A. Stafford
Box 163, Reno, Nevada.*

Cmd. Albert Marple, 716 S. Louise St
Islandale, Calif.

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POPULAR MECHANICS

8171

DESERT ROADWAY FENCED TO GUIDE MOTORISTS



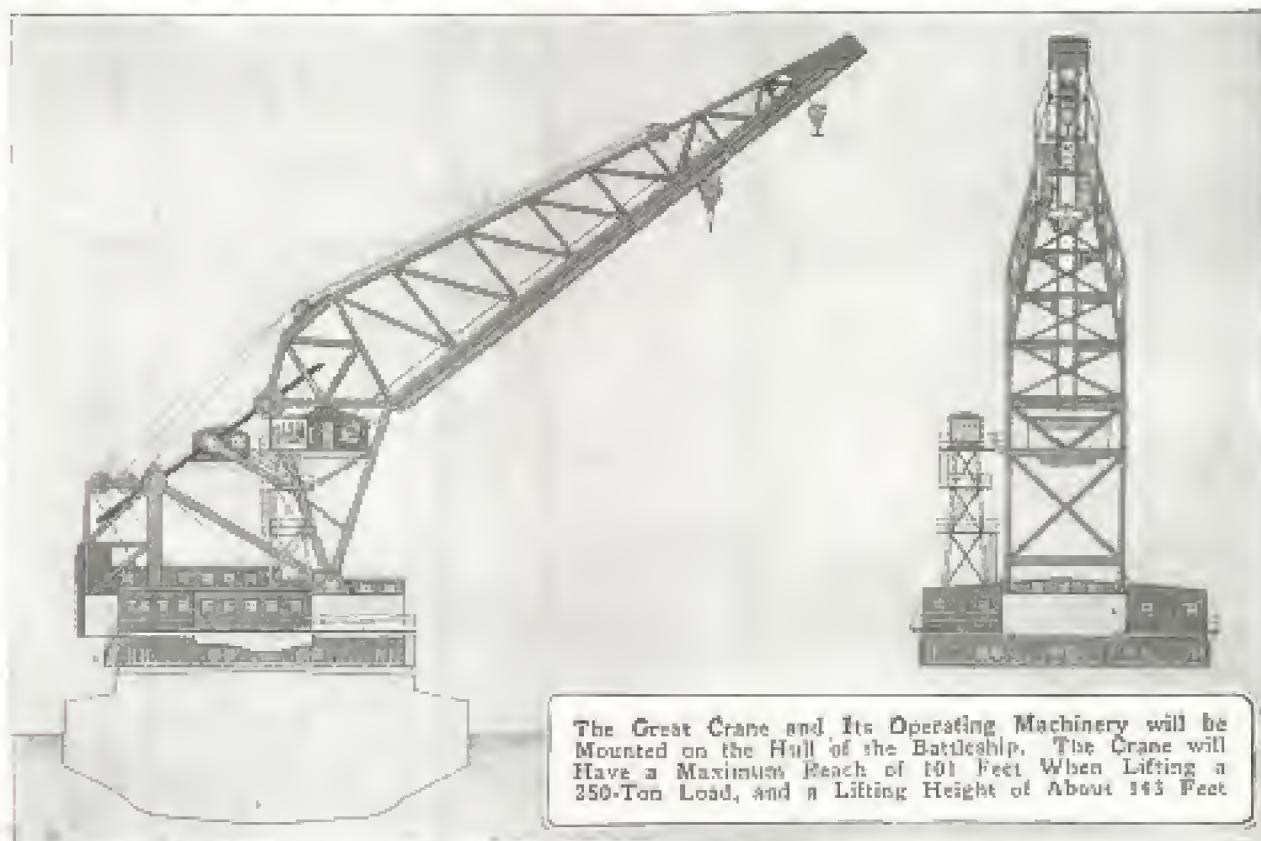
Desert Roadway Which has been Fenced to Prevent Touring Motorists from Straying off the Correct Route of Travel, and Consequently becoming Lost. These Barren Stretches of Sand are Often Encountered When Motorizing in Some of the Western States

There are several stretches of road in the deserts of western Arizona and eastern California, where the roadways are constantly being filled with sand blown by the strong winds. In many of these sections fences, consisting of iron posts and chains, are used to keep the motorists to the right path. At the seasons of the year when the winds of the deserts are unusually strong and frequent, this novel method of keeping the traveler from going astray proves valuable.

CONVERT GIANT BATTLESHIP INTO FLOATING CRANE

One of the constructive features in the scrapping of the battleships of the navy is the conversion of the "Kearsarge" into a 250-ton floating crane. When the transformation is completed, the crane will bear very little resemblance to the former fighting unit. The hull will remain, but the giant guns and battle turrets will give way to the great boom and its operating

machinery. In extended position the crane will have a maximum radius of about 174 ft., with a maximum reach of 101 ft. for a 250-ton load. The total height of lift at the 101-ft. radius will be about 143 ft. The remodeled "Kearsarge" will be used as a service crane and in the dismantling of the battleships which are to be scrapped.



The Great Crane and Its Operating Machinery will be Mounted on the Hull of the Battleship. The Crane will Have a Maximum Reach of 101 Feet When Lifting a 250-Ton Load, and a Lifting Height of About 143 Feet

The Wellman-Deaver-Morgan Co
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POPULAR MECHANICS 667



The Battleship "Kearsarge," Remodeled into a Great Floating Crane, will Play an Important Part in the Dismantling of the Naval Vessels Which are to be Scrapped. With Its Enormous Lifting Capacity and Long Reach, It will Be Able to Lift the Heavy Pieces of Fighting Equipment from the Depths of the Former Fighting Units and Transfer This Material to Docks or Barges. When the Salvaging Operations are Completed, the "Kearsarge" will be Used as a Service Crane in Handling Heavy Equipment.

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SERVICE-BANNER MEMORIAL IN GENESEO, ILLINOIS

A war memorial in the form of a many-sided service banner inscribed with 497 names of the soldiers and sailors of six



NAME	KEY TO SERVICE DENOTED
J.B.C.	RED CROSS NURSE
J.M.S.J.	DIED IN PRISON
J.M.S.A.	DIED IN ACTION
J.H.E.	CITED FOR BRAVERY
J.H.A.G.	DIED IN SERVICE
J.S.N.E.G.	WOUNDED IN ACTION
J.M.H.L.	OVER SEAS 12 MONTHS
J.C.H.W.W.	OVER SEAS 6 MONTHS
J.A.	OVER SEAS 1 YEAR
J.M.J.	DIED AFTER DISCHARGE
J.E.	PRISONER OF WAR
J.S.B.	IN AMERICA UNDER NO.
J.K.E.G.	IN AMERICA 6 MONTHS
J.S.L.	IN AMERICA 1 YEAR
J.D.N.H.	CITED FOR GALLANTRY

Left: General View of Service-Banner Memorial. Right: Close-Up of Key to Meanings of the Various Stars, 15 in Number, One of Which beside Each Man's Name Denotes, by Its Color and Other Details, the Nature of His Service

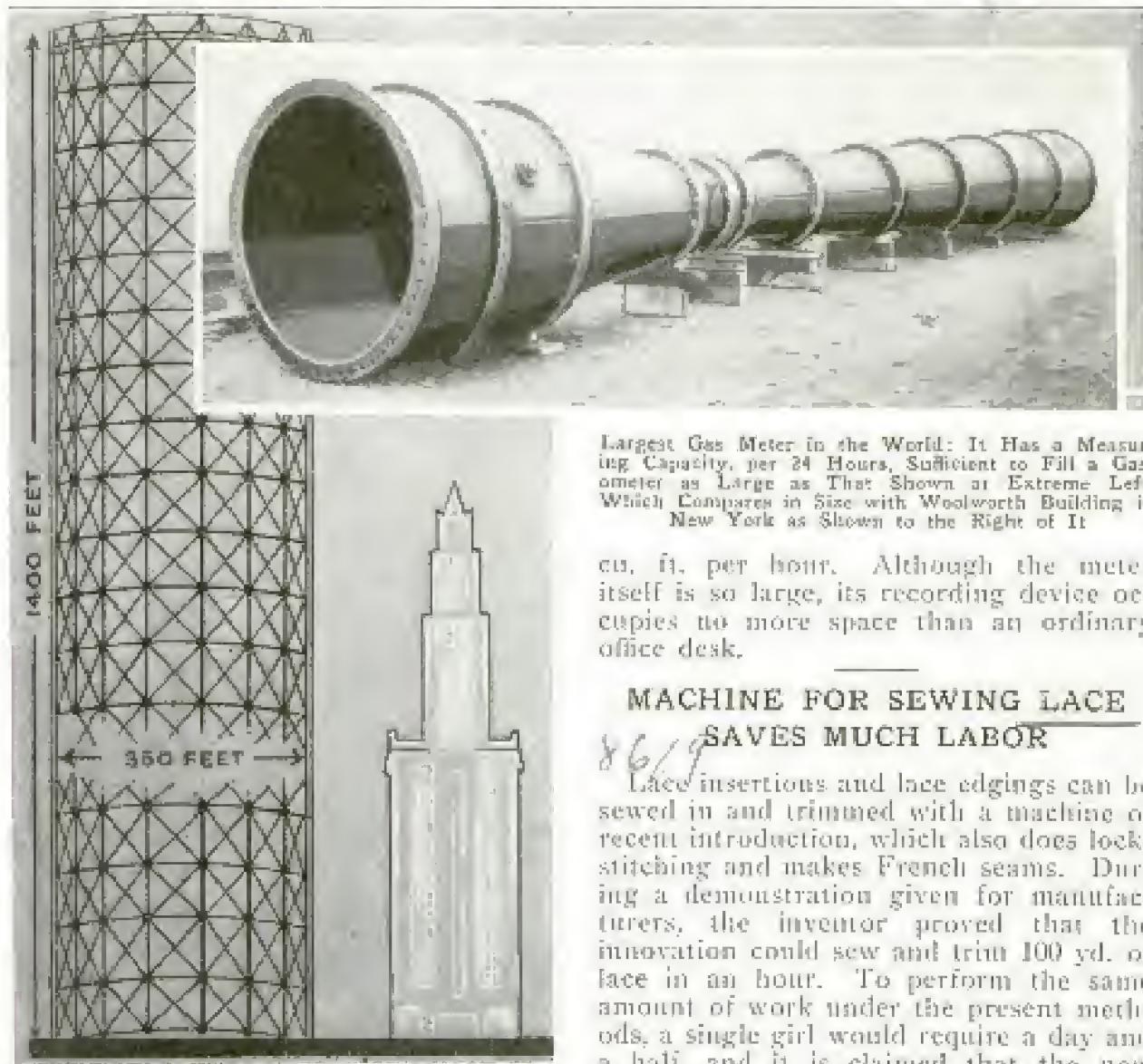
townships, has been erected in front of the public library at Genesee, Ill. In front of each name is a five-pointed star that indicates graphically, by its color and various details, the nature of the man's service, and something of his history. For instance, a plain gold star denotes "died in service," a star with a small medallion on each point means "died in action," and a star with five plain gold tips denotes "died after discharge." This last item is to be kept up to date, and therefore, eventually every star for discharged men will have the five gold tips. A key to the various stars, 15 in number, is part of the banner. The monument is a substantial structure surmounted with a conical roof bearing a flagpole. It is brilliantly illuminated with electric lamps, so arranged that all the names can be read at night.



SNOW-BOUND CITIES REACH OUTER WORLD BY RADIO

Application

IN the latter part of February, when the state of Wisconsin was visited by one of the worst snow and sleet storms in recent years, untold damage was done to trees and orchards, and all regular forms of communication were put out of commission. Miles of telephone and telegraph wires and power lines were torn down by the weight of the ice coating. In this emergency, radio stations were brought into service and kept the snow-bound cities in touch with the outer world until normal means of communication were reestablished.



LARGEST VENTURI GAS METER THAT HAS YET BEEN BUILT

What is said to be the largest gas meter in the world, built upon the principle of the Venturi, which consists of a conical, nozzlelike reducer, followed by a gradual enlargement to the original size in a pipe line, is in use at the Bethlehem Steel Company's plant at Sparrow's Point, Md. It is for the purpose of measuring the combustion gases from the blast furnaces, which formerly were wasted, but which for many years now have been a valuable by-product at all steel-producing plants. The meter is 59 ft. long, and the diameter of the pipe line is 72 in., the Venturi throat diameter being 26 in. It is calculated that the measuring capacity of this huge meter per 24 hours is sufficient to fill a gasometer 350 ft. in diameter and 1,400 ft. high, or about twice the height of the Woolworth building, in New York. The meter's rated capacity is 5,700,000

Largest Gas Meter in the World: It Has a Measuring Capacity, per 24 Hours, Sufficient to Fill a Gasometer as Large as That Shown at Extreme Left, Which Compares in Size with Woolworth Building in New York as Shown to the Right of It.

cu. ft. per hour. Although the meter itself is so large, its recording device occupies no more space than an ordinary office desk.

MACHINE FOR SEWING LACE SAVES MUCH LABOR

Lace insertions and lace edgings can be sewed in and trimmed with a machine of recent introduction, which also does lock-stitching and makes French seams. During a demonstration given for manufacturers, the inventor proved that the innovation could sew and trim 100 yd. of lace in an hour. To perform the same amount of work under the present methods, a single girl would require a day and a half, and it is claimed that the new machine will consistently produce an average of 12 times the production of one operator.



Operator Using Motor-Driven Lace-Sewing Machine Which Equals the Production of 12 Hand Workers

C. W. C. N. Sharp
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161 Massachusetts Ave.

8719 American Isao Accymulalot Co
mpy Elizabeth, A.
Barbier, Bernard & Feranne,
Paris, France



In This Bleriot Air Liner of French Construction, Great Attention has been Given to the Question of Wind Resistance. The Four Motors are Carried in Pairs on the Lower Wing and are Enclosed in Streamline Housings.

GUIDING THE AIR LINER INTO PORT

By EVERETT J. LOVETT



The Interior of the Liner Resembles a Railroad Parlor Car with Its Comfortable Armchairs and Large Observation Windows

COMMERCIAL aviation, particularly in Europe, is fast approaching a point where it is an accepted mode of travel, and the success of the shorter routes has led to the establishment of lines of international scope. As typical examples of some of the present routes might be mentioned those from London to Copenhagen by way of Amsterdam and Hamburg; from Toulouse, France, to Casablanca, North Africa, by way of Barcelona and Gibraltar, and from Cairo to Bagdad; while some account should be taken of some of the proposed routes, such as the one from Paris to Algiers by way of Italy and Sicily, and the route from Paris to Warsaw by way of Strassburg and Prague.

There is no doubt that the history of these longer routes will be only a repetition of the success of the short ones, and that the flying companies feel assured of this, is evidenced by the plans they are making for the safety and comfort of their passengers.

The question of comfort is really of secondary importance and has already been answered in a satisfactory way in the latest limousine planes affording ample space for passengers, and furnished with comfortable arm-chairs in which one may sit at ease and view, through large ob-



Even the Landing Gear has been Given a Streamlined Housing in the Effort to Reduce Head Resistance to a Minimum. The Struts are Flexibly Hinged to the Fuselage, in Order to Reduce the Shock in Landing

and Impervee & Belgique, Antwerp, Belgium
M. Paul, Paris, France. Wide World Photos, New York

8729



The Great Lighthouse as It will Appear When Erected on Top of Mount Afrique, Nine Miles from Dijon, France: Situated at an Elevation of 1,500 Feet, This Light will Be Visible, under Favorable Conditions, for a Distance of Nearly 200 Miles, and will Be One of the Guiding Beacons on the Paris-Algers Air Route. Right: The One-Billion-Candlepower Lighthouse as It Appeared Before It was Shipped to Mount Afrique. The Steel Base Is About 18 Feet in Diameter, and the Light is Furnished by Two Banks of Arc Lights Arranged Four in a Group. This Lighthouse Is the Largest Made, Up to Date, for Use in Making Aerial Navigation Safer.

servation windows, the varying panorama passing below as the ship speeds on.

As the longer air routes become more popular, as they surely will, there will be more and more necessity of night flying, and the companies are anticipating this by the erection of lighthouses at intervals along the line. Lights of limited intensity and with a visual range of from 20 to 40 miles have been in use on the Louviers-Paris route, but these will be dwarfed by the light that is now being

installed on the top of Mt. Afrique, near Dijon, France. This will be of one billion candlepower and will be visible, it is claimed, at a distance of nearly 200 miles under favorable conditions, and will be one of the guideposts on the international airway between France, Italy, and Algeria. Two groups of arc lights, arranged four in a group, will furnish the illumination for this beacon which has taken more than two years to construct. The lenses and lights are carried in a steel tower, 18 ft. in diameter, which will be solidly supported on concrete foundations at the top of the mountain, 1,500 ft. high, adding materially to the visible range of the light.



One of the Smaller Lighthouses on the London-Paris Route is Equipped with Lenses for Throwing a Horizontal Beam, and Four Reflecting Lights Which Project a Vertical Beam



Above: The Controller of Traffic Using a Pistol Flashlamp from the Balcony of the Control Tower. Left: From the Inside of the Tower He can Communicate with the Approaching Flier by Wireless Telephone and Give Him Special Information as to Ground Conditions. All Landing and Signal Lights are Controlled from the Tower. Right: Using an Electric Flasher to Communicate with the Airman



Jno. 21 Mc Clure's

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POPULAR MECHANICS

673

Philadelphia Pa.

him the direction and strength of the wind, while the controller of traffic will give him by wireless telephone any special information that he may need for his guidance, such as the amount of fog and

ground mist, and the condition of the landing field itself. In this way he will bring his craft into port with the same certainty as the captain of an ocean liner brings his ship into the harbor.

8726

MOVING PICTURES GAIN GRANT OF IMPROVEMENT FUNDS

Displaying motion pictures or stereopticon views of contemplated civic improvements for the purpose of obtaining necessary appropriations, is the method used by the Department of Public Works of Philadelphia, when the question comes up before the city council. Heretofore, considerable friction has developed among the aldermen relative to the size and need of various requests for funds to start or complete a municipal project, and principally because the council members were not sufficiently familiar with the work. By showing motion, or other, pictures of each prospective undertaking, together with a lecture on the subject, the city engineers hope to create a better understanding and unity among all parties concerned. The plan was inaugurated with an illustrated discussion of proposed improvements of the city's sewage-disposal system.

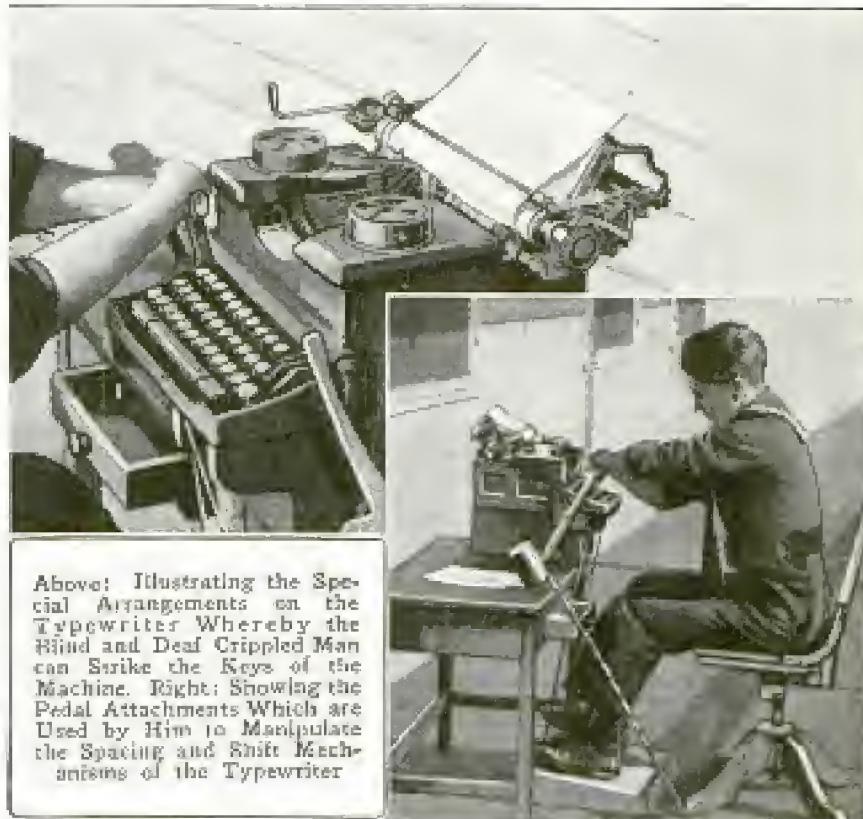
8731 *Rudolph Blaschka* GLASS MODELS OF FLOWERS AT HARVARD UNIVERSITY

The artist who modeled the famous "glass flowers," now in the Botanical Museum at Harvard University, is at work on a supplementary collection of glass models of grasses and sedges, which will be exhibited at the university on their completion. The collection now illustrates 160 families of flowering plants, and 803 species. Besides these there are more than 3,200 enlarged details. All the specimens were made by Rudolph Blaschka, who has now in his studio in Germany 20 models and 50 enlarged details, which, when transported to Harvard, will complete the collection.

8685

BLIND AND DEAF CRIPPLE OPERATES TYPEWRITER

Terribly handicapped by the loss of both hands, eyes, and hearing, a persever-



Above: Illustrating the Special Arrangements on the Typewriter Whereby the Blind and Deaf Crippled Man can Strike the Keys of the Machine. Right: Showing the Pedal Attachments Which are Used by Him to Manipulate the Spacing and Shift Mechanisms of the Typewriter

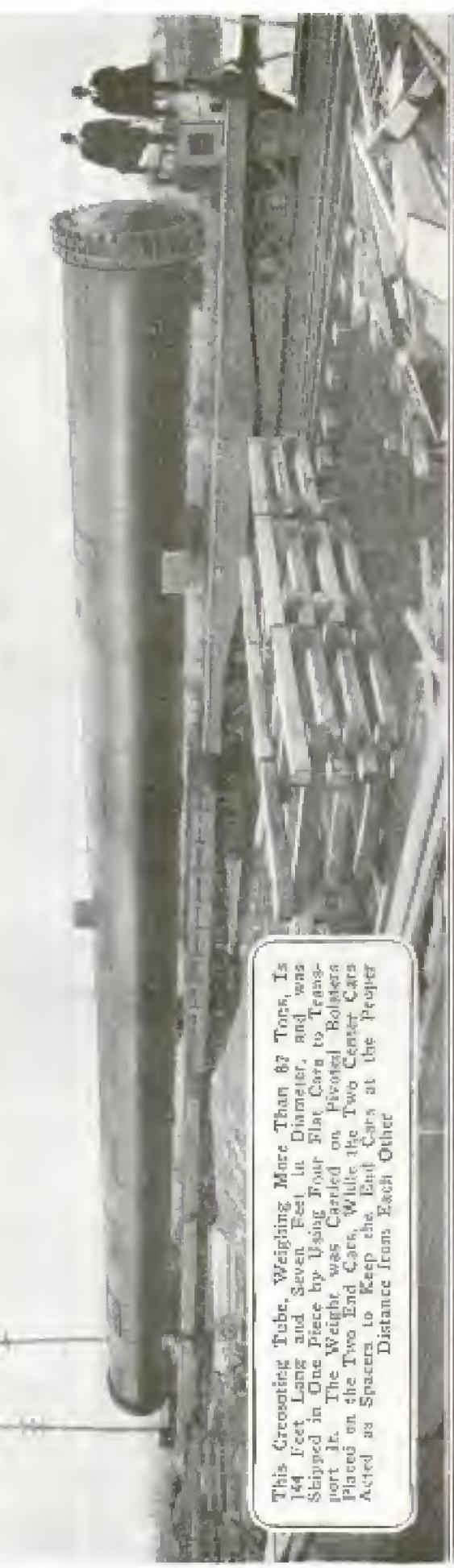
PHOTO BY COLUMBIA SERVICE

ing ex-service man has overcome seemingly impossible obstacles in learning to operate a typewriter. Special arrangements on the machine enable the maimed man to strike the keys, while pedal attachments are provided so that he can manipulate the spacing and shift mechanisms. Observers have viewed with astonishment the speed and accuracy attained by the young fellow in spite of his disheartening affliction, and marveled at his great perseverance.

A motor lifeboat of very unusual proportions and characteristics is to be built for use at New Brighton, Eng. The boat will have a displacement of 60 tons, and a passenger-carrying capacity of over 150. Its equipment will include a line-throwing gun, a searchlight, a life-saving net, with first aid, and also heating appliances in its two cabins.

Science 3/16/72

*John Lubbock Library Service City
New York City*



This Creosoting Tube, Weighing More Than 87 Tons, Is 144 Feet Long and Seven Feet in Diameter, and was Shipped in One Piece by Using Four Flat Cars to Transport It. The Weight was Carried on Pivoted Bolsters Placed on the Two End Cars, While the Two Center Cars Acted as Spacers to Keep the End Cars at the Proper Distance from Each Other.

CORRECTION, p. 6, page 2

IMMENSE CREOSOTING TUBE MAKES FREAK SHIPMENT

Unusual arrangements characterize the method devised for shipping a recently manufactured tie-treating tube, which is 7 ft. in diameter and 144 ft. long. Four flat cars were needed for the shipment, but only the two end cars carried any weight, the center cars acting solely as spacers. The tube was carried on pivoted bolsters which allowed it to swing when the train was rounding a curve, and much care was exercised in selecting a route which was free from very sharp curves. The tube is to be used in creosoting ties which will be run in on cars, after which the door is locked and the tube filled with creosote, which will be forced into the ties by subjecting it to a pressure of from 125 to 200 lb. per square inch for a period of four hours.

TINTED GLASS FOR PRODUCING ARTIFICIAL DAYLIGHT

For very delicate work in matching colored fabrics under artificial light, a new tinted glass has been developed. An ordinary gas-filled electric bulb is used in combination with a disk of this tinted glass and a reflector coated with a suitable blue pigment, and it is found that the light emerging through the disk more closely resembles natural daylight than any previous combination. A strong light, however, is necessary as almost two-thirds of it is absorbed.

AVERAGE COSTS OF VARIOUS TYPES OF ROAD PAVING

The Bureau of Public Roads has recently compiled figures on the average cost per square yard of various types of paving for country roads, over a period of five years, with the following results: sand-clay, 18 cents; gravel, 46 cents; plain and surface-treated macadam, 95 cents; bituminous macadam, \$2.10; bituminous concrete, \$2.50; plain cement concrete, \$2.57; reinforced cement concrete, \$2.74, and brick, \$4.10. These figures cover only the cost of paving, and do not include the cost of grading.

Sept. Agric. Press Clif. #195

Because the sea lions and hair seals play havoc with the fishing industries on the British Columbia coast, the Canadian fisheries department plans to attack the seal rookeries on Queen Charlotte Islands with machine guns.



High-Powered Electric Train Now Running between Moscow and Petrograd, in Russia: It is Said to Have 3,000-Horsepower Electric Motors, and to Run the 500 Miles between the Two Cities without Stoppage for Recharging.

8686

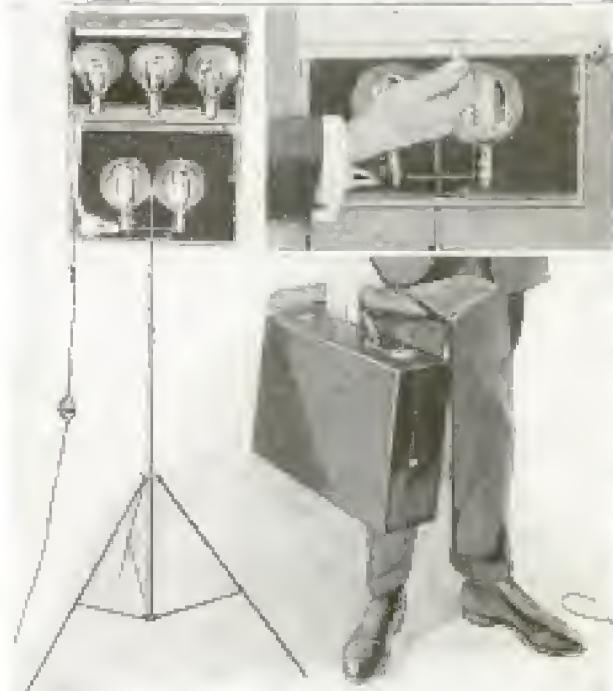
EXCEEDINGLY HIGH-POWERED RUSSIAN ELECTRIC TRAIN

Recently a new type of electric railway car has been developed in Russia that is said to equal anything of its kind anywhere. Trains of these cars are now running from Moscow to Petrograd, a distance of 500 miles, without stoppage for recharging. The train is said to be equipped with electric motors of 3,000 hp. The Soviet government aided the inventor in the design and development of these high-powered cars, and all details of their construction are being kept secret.

HOME PHOTOGRAPHY IS AIDED BY NEW PORTRAIT LAMP

Employing a battery of five 400-watt bulbs, a new portable portrait lamp has been introduced by an Illinois manufacturer, which has great flexibility of operation. The apparatus is constructed in two hinged sections, so arranged that either may be used as a separate unit, and the power of these units may be decreased by unscrewing enough bulbs to meet the requirements of the occasion. In addition, the lamp has special reflectors so that the greatest possible efficiency of

lighting effects is procured, and a diffusing screen is also provided. The entire outfit, not including the stand, weighs 12 lb., and can be packed in a 5 by 12 by 17-in. case for carrying purposes.



Left: Portrait Lamp and Stand. Upper Right: Pulling Down the Diffusing Screen. Lower Right: Lamp and Stand Packed for Carrying

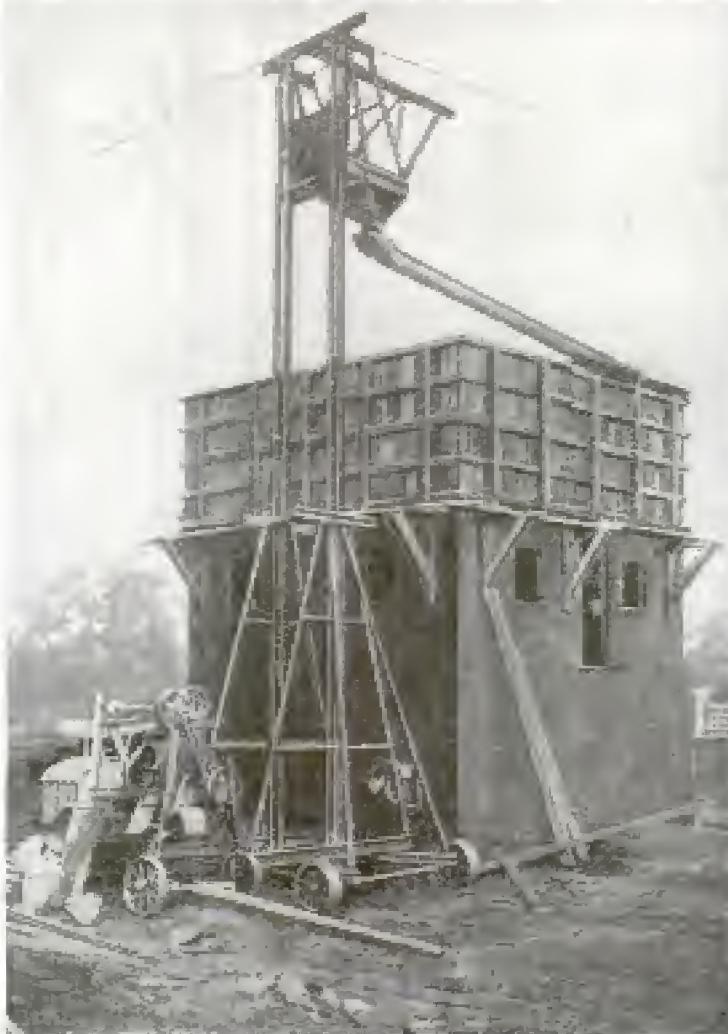
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draw. Miss Kate Isseason, East Rochester, N.Y.

858² FIREPROOF CONCRETE HOUSES BUILT ECONOMICALLY

Concrest is the appropriate name given to a village at East Rochester, N. Y., that is being built entirely of monolithic-concrete houses, each being a villa on its own garden site, and with distinctive individual features of design. These houses have a basement and two stories, with seven rooms, besides an attic, and their concrete construction has been so standardized that it is possible to sell them at a profit for \$4,000. A telescoping portable tower, specially designed for this construction, makes it possible, with great economy of labor, to pour one story at a time instead of all three at once. The tower can be raised or lowered to suit each story.

height, and the concrete is poured from it at a suitable height. Thus, in pouring the basement, without this tower, every bucketful of concrete would have to be raised twice as high as is required with the tower at its lowered position.



Monolithic-Concrete House under Construction: Wooden Forms for Upper Story Are in Place, and Concrete is being Poured from the Telescoping Portable Tower with Its Funnel-Shaped Outlet, Which is Raised to Its Full Height.

The Bureau of Mines is seeking a rapid method for the direct determination of the amount of metallic aluminum in commercial aluminum and its alloys and drosses, and also the determination of aluminum oxide in the light alloys. The problem of oxidation of aluminum will also be studied. These investigations are most timely, as the subject of light alloys is one of much importance.



A Corner in the Village of Concrest, with Three Houses in the Foreground That Are Typical of the Rest: Built of Concrete, the Exteriors Are of Tinted Stucco, and the Roofs of Different Colors.



Upper Left: High-Speed Turbine Pump and Other Fire-Fighting Apparatus, Mounted on Ordinary Car. Upper Right: Pump Fitted on Lightweight Engine. Lower Left: Close View of Pump

HIGH-SPEED TURBINE PUMPS PLACED ON MOTOR CARS

The transformation of any pleasure car or truck into an effective fire engine is made possible by the installation of a small high-speed turbine pump, which is designed to be mounted just below the radiator, or at the rear of the machine, and be driven direct from the crankshaft. The pump is built in three sizes by an Italian concern, the smallest being suitable for attachment to a 10 or 12-hp. motor; the medium size for a 25 to 30-hp. motor, while the largest size is made for 50-hp. trucks, and these weigh 77, 187, and 322 lb., respectively. The invention should be of particular interest to small communities unable to afford the more expensive fire equipment.

NEW READING MACHINE MAKES POCKET LIBRARY POSSIBLE

With the use of a new reading machine, a small library may be carried in the vest pocket, according to the claim of its inventor. The instrument makes legible, through a lens, typewritten matter that has been photographically reduced to ex-

treme talloid size. The typewritten characters are about .01 of their natural size, and are on a strip of paper that fits in a small aluminum frame, at one end of which is mounted a lens and eyepiece. A small roller attached to the frame is moved by the forefinger, and the paper rolls along so that line after line of the reading matter passes the lens. The instrument is $6\frac{1}{4}$ in. long, $1\frac{3}{8}$ in. wide, $\frac{3}{4}$ in. thick, weighs about 5 oz., and is easily carried in the pocket.



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Reading Machine That Uses Reading Matter of Extreme Minuteness, as Seen in the Four Columns on Printed Strip in Its Aluminum Frame. Inset: The Inventor Showing How the Instrument is Used

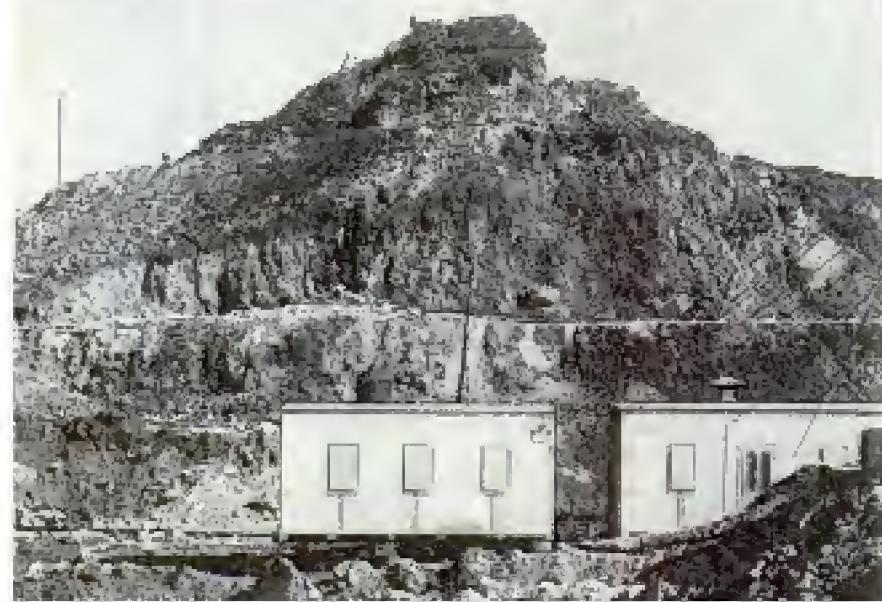
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8646 Cont. U. W. Allen
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POPULAR MECHANICS

TRAVELING CRUSHER STATION AND ASSAY OFFICE

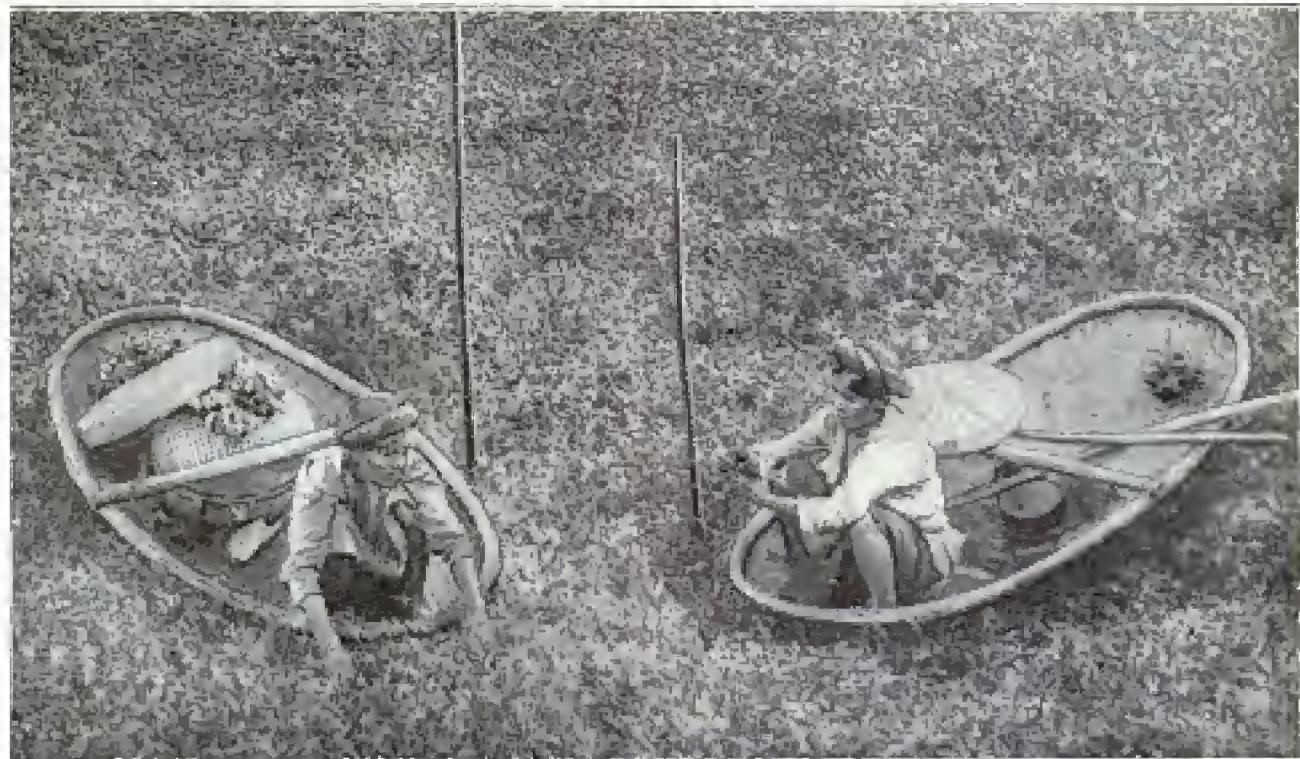
As a rule, modern copper-mining operations have to be conducted on a considerable scale, because the high-



Crusher Station and Assay Office Which Travels by Railroad to the Different Mining Locations Where Samples of Ore are Analyzed and the Results Reported to the Operators

grade deposits, for the most part, have been exhausted. A case in point is found at Bisbee, Ariz., where the moun-

tain known as Sacramento Hill is copper-bearing, but most of it ranks as low grade ore, and some is too poor to be treated by ordinary milling, concentrating, and smelting methods. It requires a close control of operations to grade the ore and reject the waste rock. An accurate knowledge of the copper content is possible only by means of chemical analysis. A prompt decision as to how much copper is contained in an exposed face of rock is often necessary, so a traveling crusher station and assay office has been designed. When put in operation, it can be moved on a railroad track as required. Thus it is possible to crush a sample to powder and analyze it for copper right on the spot, and report the result to the operators without delay.



SPINACH PICKERS USE BOATS ON LARGE CHINESE MARSHES

STRANGE methods are employed by the Chinese in the picking of spinach from the large marshes in that country, on which grow vast stretches of this plant. The pickers use small boats of a peculiar shape and construction, two of them being shown in the above photograph. The boats are paddled and pushed around through the thick vegetation until a carefully selected load has been gathered for the market.



International
Natives of Rhodesia, Africa, Removing a Mammoth Anthill That Was 25 Feet High, and Was an Obstacle to Cultivation: Anthills of This Kind Are Very Numerous in Rhodesia and the Belgian Congo

SOUTH AFRICAN ANTS BUILD SKYSCRAPER ANTHILLS

Anthills, all over South Africa, but particularly in Rhodesia, are of proportions unknown in America, reaching sometimes a height of 25 ft. or more, and, in spite of the steepness of their sides, covering a very large ground area. They are made of clay, sunbaked to the hardness of bricks, and are the outcome of many years' labor on the part of the industrious ants. Sometimes they are an advantage to the pioneer settlers, often furnishing them with material for making their first homes. At other times they may be an obstacle, preventing the cultivation of the ground they stand on, and then it becomes necessary to remove them. In the case of an anthill 25 ft. high, this is no small task, and may involve as much labor as is required to demolish a fair-sized city building.

8654

ALTERNATING CURRENT USED IN ELECTRIC WELDER

An alternating-current electric welder that does the work as efficiently as with a direct current has been developed by an engineering corporation in Indiana. The welder uses the ordinary city 110-volt current. A patented fusing metal

used in the welding point is the most important feature in connection with this welder, and is said to leave the welded metal just as hard as the original metal in any casting. The welder has been used mostly in repairing scored cylinder walls of automobile engines.



Alternating-Current Welder being Used in Repairing the Badly Scored Cylinder Walls in an Automobile Engine: The Welding Point can be Seen in the Bottom Cylinder

*Wainwright Engineering Corp
Connersville, Ind.
Grovilla material*

7660 IRON PISTONS MADE LIGHT
BY SKILLFUL DESIGN



That desirable quality — lightness — is obtained in the pistons of high-speed gasoline engines often by the use of light material, such as aluminum alloys, and sometimes by the use of common cast iron, with the lightness achieved by the scientific construction of the piston. A good example of the latter is one in which strong reinforcing ribs are cast integral with the piston, radiating from a center reinforcing ring in the head and extending down the full length of the wall. These webs, with their large radiating area, aid materially in dissipating the heat, as well as in strengthening the walls and head, and therefore they add to efficiency as well as lessen vibration, and it is said that they greatly increase gas and oil mileage.

865 NEW MOTOR BUS FOR CHICAGO
NEARLY EQUALS STREET CAR

That the motor bus as a means of transportation has met with popular favor, is evidenced by the development that has been made in the busses during the last few years. Recently the first of a new



The New Motor Busses Placed in Service in Chicago Are Much Larger Than the Older Ones, Being, in Fact, Almost as Large as Street Cars, Which They Resemble with Their Comfortable Seats and Inclosed Compartment for the Driver. The Entrance Platform at the Rear is Placed Conveniently Low

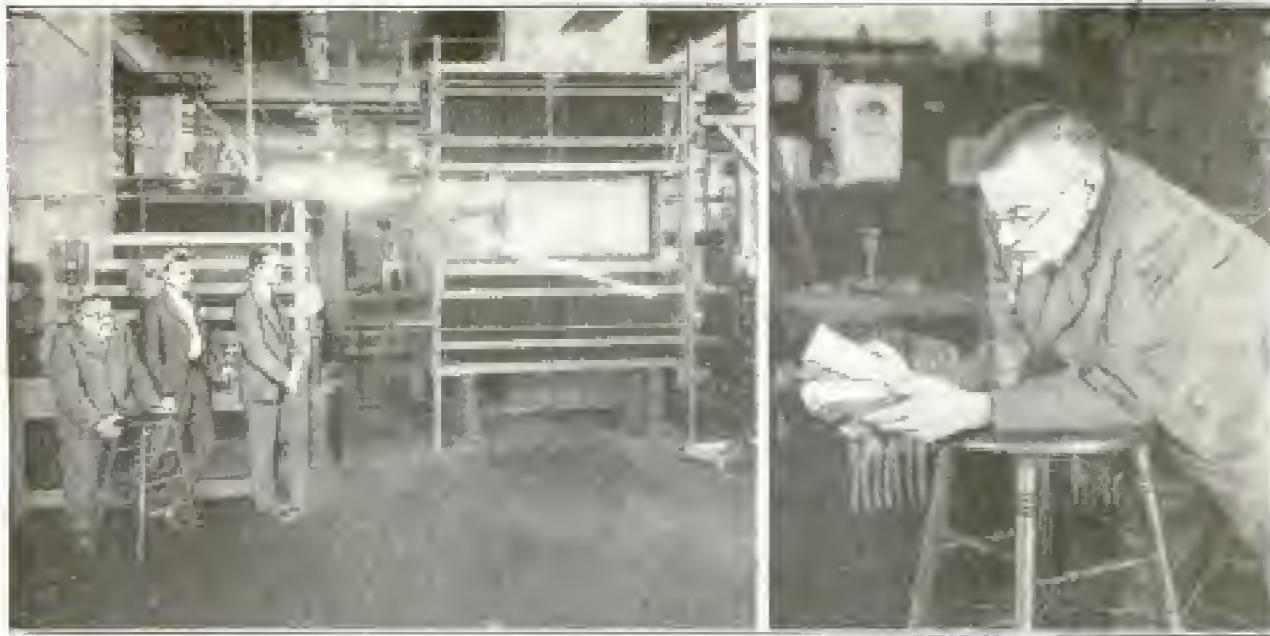
type has been placed in operation in Chicago which approximates the size and carrying capacity of the ordinary street car. This bus is of the double-deck type and will accommodate more than 60 passengers, is equipped with comfortable seats, and has a separate inclosed compartment for the driver. The open upper deck is reached by an outside stairway.

9659 MACHINE FOR WALL PAPERING
HOLDS PASTE AND PAPER

Papering a room is a sticky task for the novice, who usually smears everything within reach with the gummy paste, including his own irate person, and ruins several rolls of paper before the job is completed. A remedy for this has been produced in a machine having containers for the paste and paper, and a pressing or smoothing brush. The machine can be operated with one hand, the paste being automatically applied to the paper, which is "brushed" as the apparatus is drawn down the wall.

There are more than 1,200 small irrigation and water-supply projects either completed or under construction in Alberta and Saskatchewan, Canada.





Left: Part of Equipment Used to Produce Artificial Lightning Bolt, Which can be Seen in Front of the Condenser-Generator. Right: Doctor Steinmetz Examining Wood Fragments Shattered by Imitation Lightning

ARTIFICIAL LIGHTNING BOLT REALISTICALLY PRODUCED

Artificial lightning bolts which perform exactly the same as nature's shattering strokes, although on a miniature scale, have been produced by Dr. Charles P. Steinmetz and associate engineers of the General Electric Company. The amount of power expended in each demonstration totaled more than 1,000,000 hp., obtained by the generation of 10,000 amperes at 120,000 volts. The apparatus used consists essentially of a high-voltage condenser of large capacity, in the form of 200 glass plates which are arranged in groups of 50, and in two rows, or banks. Rectified direct current is stored in these condensers, one end representing the thunder cloud in the sky, in which an electric charge is gradually accumulating to its capacity, and the other end corresponding to the earth. When the tension of the stored energy becomes greater than the condenser will hold (120,000 volts, at 10,000 amperes), a flash to the "earth" end results, thus imitating a discharge of lightning to the ground. By placing pieces of wood or other articles in the path of this powerful flash, or discharge, the tearing, explosive effects of genuine lightning were realistically produced.

As a means of protection for women traveling alone. A Canadian Pacific-coast steamship company furnishes each with a small ribbon which indicates by its color to what province she is traveling.

SNAP GAUGE THAT MEASURES ERRORS IN SIZE EXACTLY

A new type of gauge that does the work of a "go" and "no go" snap gauge, but which has a scale graduated to .0001 in. that shows exactly how much a piece of work is over or under the nominal size, is now in use in England. The instrument is shaped like an ordinary snap gauge, and has a movable plunger in one jaw which, through a system of boxed-in levers, operates a pointer on a scale, like the pointer of an ammeter or voltmeter. On a standard piece of work that is of the exact nominal size, the gauge is adjusted so that the pointer is at zero. In



Gauge That Shows, with a Pointer on a Scale Graduated to .0001 Inch, Exactly How Much a Piece of Work Is over or under Size

testing other similar pieces of work, any variation under or over size is then shown on the scale.

*End George Pringle
140, Tidmarsh Road,
Chelmsford, Essex, England*

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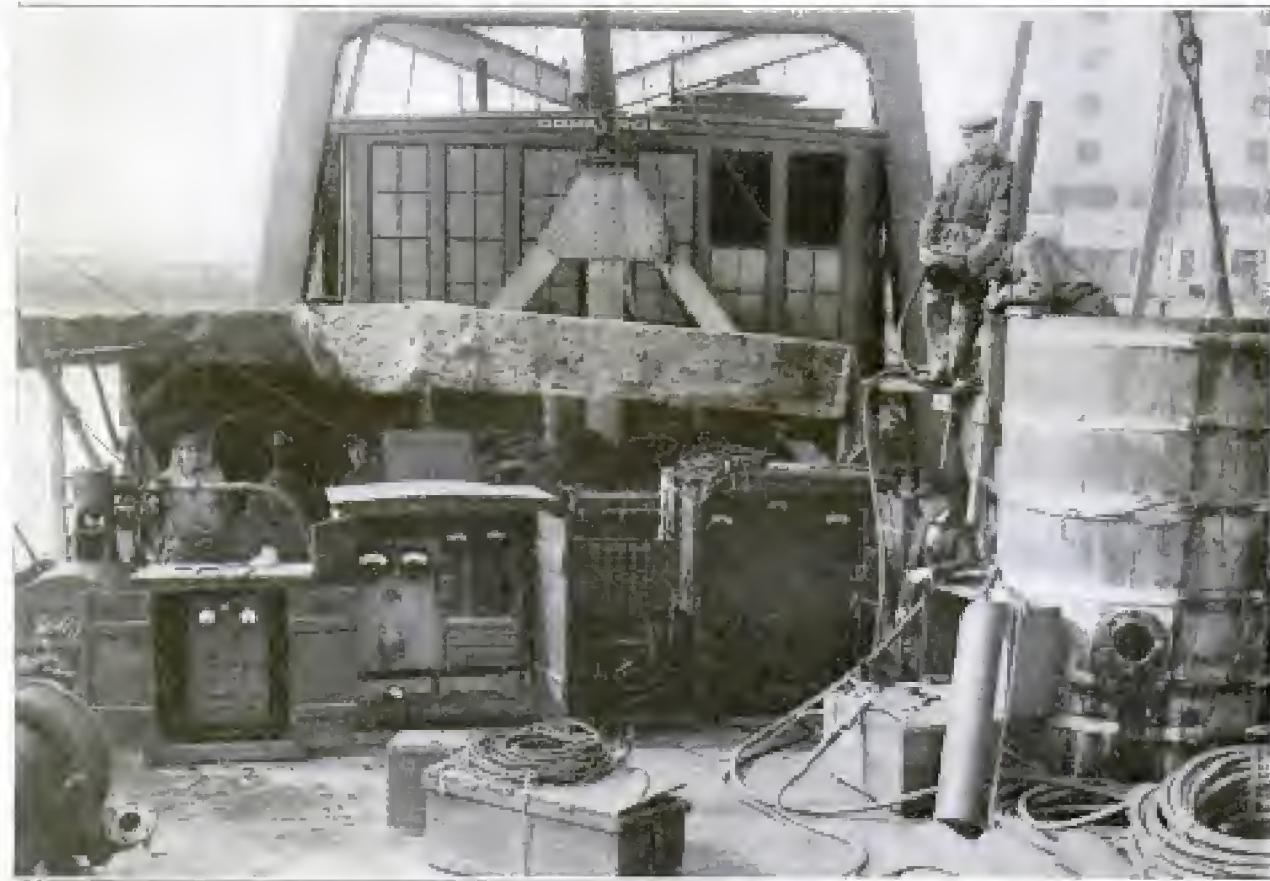
TORCH CUTS CAST IRON IN FIFTY FEET OF WATER

By A. M. HOFFMANN

114 Stuyvesant Place
New Brighton, Staten Island, N.Y.

page 745, which had already gone to press before these further interesting details had been received.

Early in February, a dredge accidentally smashed a hole in one of the many 12-ft. sections of which this main is composed. As this pipe line supplies Staten Island with water, it was imperative that service be restored as quickly as possible. This was accomplished in record time by the aid of a gas-electric underwater cutting torch, an American invention promising to have a wide field of usefulness.



Above: Bringing Up the Broken Length of Pipe Which was Cut Out of Water-Supply Line with the New Type of Submarine Torch. Below: The Assembled Plant Used in Operating the Submarine Torch. The Tank at the Right was Used for Training the Divers for This Work and for Testing the Torch

Used by Merritt & Chapman Derrick &
Wrecking Co., 17 Battery place,
New York City.

Inventors, Ralph E. Chapman and J. W. Kirk.



The Diver, without His Helmet, is Demonstrating the Action of the Torch Just below the Surface of the Water. The Gas is Supplied to the Torch through a Flexible Hose Which Also Carries the Electric Wires Furnishing the Current for the Electric Arc with Which the Cutting is Done. The Torch can be Taken under the Water Unlighted and the Gas and Electric Current Turned On When the Diver Is Ready to Begin Cutting

The submarine cutting torch is a very ingenious and simple tool, that first came into use some years ago, and which makes use of the electric arc in conjunction with a gas. The arc is relied upon to do the cutting, while the gas creates a gaseous envelope in which the arc burns. The pressure of this gas is regulated to suit the depth at which the torch is employed. Both the current and the gas are fed from the surface, and the hose that supplies the gas also carries the electric conductor.

On the job, the diver takes the submarine torch down with him unlighted. When he reaches his goal he signals his attendant to turn on the current. In order to make the tool operate, it is only required to hold it a fraction of an inch away from the metal that is to be cut, and instantly the spark jumps the gap and arcing begins. This arc burns away the metal in the same manner as when it is used in the air.



The Broken Pipe on the Dock: The Diver is Showing How the Submarine Torch was Used in Cutting the Pipe at the Bottom of the Harbor, Where the Divers Worked in Two-Hour Shifts Because of the Cold Water

according to the city fire marshal of that place. Severe accidents, and in some cases fires, have resulted from the ignition of hydrogen-filled playthings by a lighted cigar or cigarette.

Detroit News

1/8 Copyright material

8698 Built by:
Mess. Barr + Stroud

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POPULAR MECHANICS

LONG SERIES OF ARCHES AFFORD STUDY IN PERSPECTIVE

The arcade connecting the new buildings of the recently built Marine Bar-

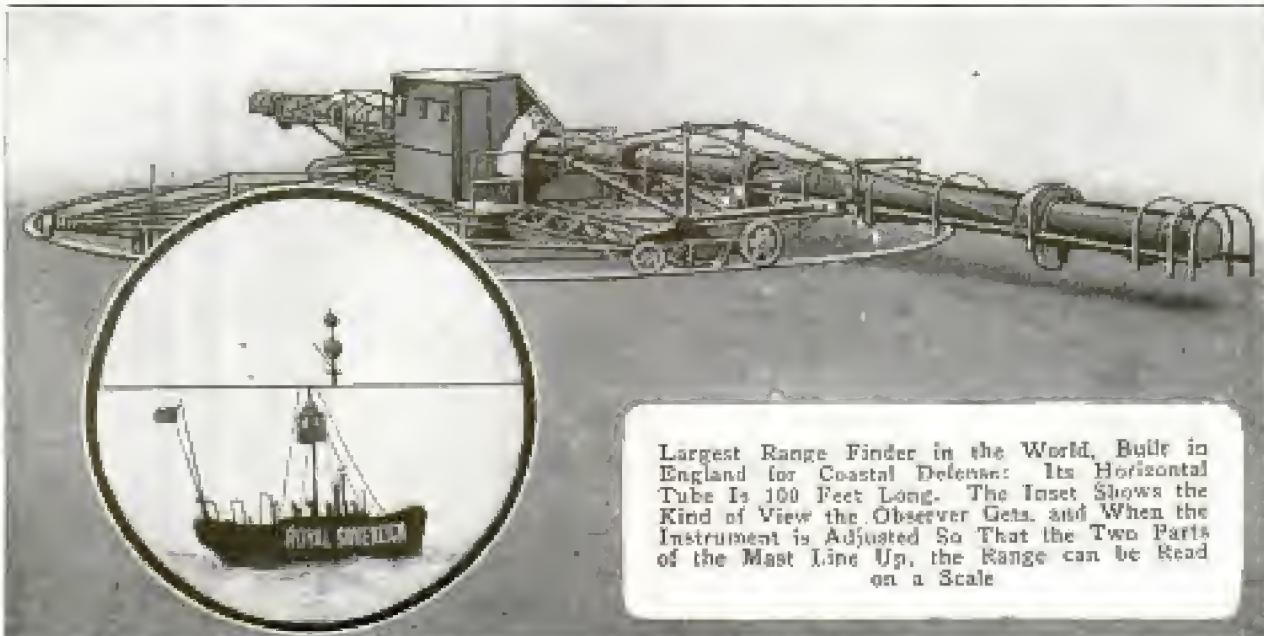


View from One End of a Series of Arches Forming an Arcade 3,000 Feet Long, Which Shows Perspectively the Other End Converged Almost to a Pin Point

racks, San Diego, Calif., is over a half-mile long—3,000 ft. to be exact. The arcade and buildings are built in mission style, with concrete archways, rough stone floors, and beamed ceilings. The perspective shows lines converging almost to the vanishing point.

HUGE BRITISH RANGE FINDER WITH RANGE OF 22 MILES

The largest range finder in the world, over twice the size of any used during the war, has been constructed in England for use in coastal defense. It was designed by the two original inventors of the range finder that has been in use in the British navy for many years, and that consists of a horizontal tube carried on a central frame, which rotates with the tube on a pedestal. In using the range finder, it is necessary to be able to rotate this tube horizontally, and for that purpose, in this huge instrument, there is provided a circular track of large diameter, with the supporting frame as its center, from which radiate connections to trolley wheels that run on the track. At the observing point, beside the pedestal, there are two telescopes in the tube, and in finding the range the observer places his eyes to the eyepieces, and sees a different field with each eye. That presented to the left eye is used as a finder for correctly alining the instrument. Then the object, as for instance a ship the distance of which is to be found, will be seen with the right eye as two images separated by a thin, black horizontal line. In the case of the ship, these images might be parts of a mast. When the instrument is adjusted so that these two objects assume their proper relative positions, the distance, or range, can be read from a scale provided for the purpose. In this huge range finder the tube is 100 ft. long, and distances up to 22 miles can be measured. In the range finders of the U. S. battleships this tube is 45 ft. long.



Largest Range Finder in the World, Built in England for Coastal Defense: Its Horizontal Tube Is 100 Feet Long. The Inset Shows the Kind of View the Observer Gets, and When the Instrument is Adjusted So That the Two Parts of the Mast Line Up, the Range can be Read on a Scale



Courtesy, Associated Press

205 W. Washington, Chicago

MOST MENACING CHICAGO BLAZE SINCE THE GREAT FIRE

WHEN one whole city block and a portion of another in Chicago burned recently, it was characterized as the most menacing conflagration since the great Chicago fire. The 16-story Burlington Building was completely gutted above the eighth floor and was damaged by water below that level, but was probably the means of saving much property situated to the west of it. While severely damaged itself, it acted as a fire wall in preventing the spread of the flames to adjoining property.

P636

SMALL TRACTOR USABLE FOR VARIOUS PURPOSES

Various operations can be performed by a small tractor lately produced by an eastern inventor, the most prominent of these being weeding or hoeing the garden, or pulling a number of lawn mowers. Steering is accomplished with control handles, similar to those of a plow, which extend back to the driver's seat. In turning, one front wheel is thrown out of gear and the other turns the machine, with the stationary wheel as a pivot. Being capable of executing such sharp turns, the outfit is valuable as a garden tractor, or for cutting the grass in an orchard, or on a golf course where trees,

bushes, and obstructions of different kinds are found.



Small Tractor Pulling a Number of Lawn Mowers over the Fairway of a Golf Course. The Plowlike Steering Handles Form an Interesting Feature of the Machine

*John George C. Hodges
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Bristol, Conn.*

RAPID METHOD DETERMINES AMOUNT OF TAR IN GAS

When the gas stove fails to operate properly, it may be a sign that some trouble-causing substance has found its way into the mains and service pipes.

One of the most troublesome impurities that the gas companies have to contend with is tar, and skilled chemists are employed to test the gas in an effort to keep this tar out of the mains. In order to provide a simple and rapid means of determining the amount of tar in the gas, an instrument has now been devised which has been nicknamed the "tar camera." By passing a measured quantity of gas through a filter paper it was found that the stain left by the tarry vapors varied with the amount of tar in the gas. By comparing this stain with a set of standard colors, it is a simple matter to determine the amount of tar in the sample of gas tested, and the weight of the material deposited on the paper can be found as a further check. The tar camera, while designed for use in gasworks, can also be used to determine the quantity of moisture or suspended solids in air.



The "Tar Camera," Shown Below, is Screwed into the Gas Main and Connected to the Meter. The Valve is Opened and a Measured Quantity of Gas is Passed Through. The Vapor Stains the Filter Paper, Shown Above, and the Color Records the Amount of Tar in the Gas

POWER-DRIVEN MACHINE GUN UNDER DEVELOPMENT

Remarkable possibilities are conceivable in connection with a power-driven machine gun, said to have originated in Germany, but which is now being developed in this country. Besides having several advantages over other machine guns, it is, or rather will be when it is fully developed, driven entirely by external power, such as an electric motor, or a gasoline engine. It has a driving shaft in the breech of the gun that operates the firing mechanism, and can be run in either direction, and at very low or very high speed. It does away with troubles due to bad and variable ammunition, and it reduces the amount of gas reaching the breech mechanism. It is fed automatically with ammunition on a cartridge belt

similar to those used commonly in machine guns. In other details it will also resemble existing machine guns, such as its water jacketing of the gun barrel, and it may be mounted on a tripod. Up to the present, it has only been developed for the purpose of demonstrating by hand the operating mechanism. Later on the handwheel, with which it is now driven, will be replaced by a sprocket, which will be driven by a chain from a motor.

Unbreakable glass, which can be heated red-hot and placed in cold water without any perceptible effect, is said to have been produced in Bohemia after years of experiment. Hammers made from the product can be used for ordinary purposes.

Power Driven Machine Gun Corp
New York City

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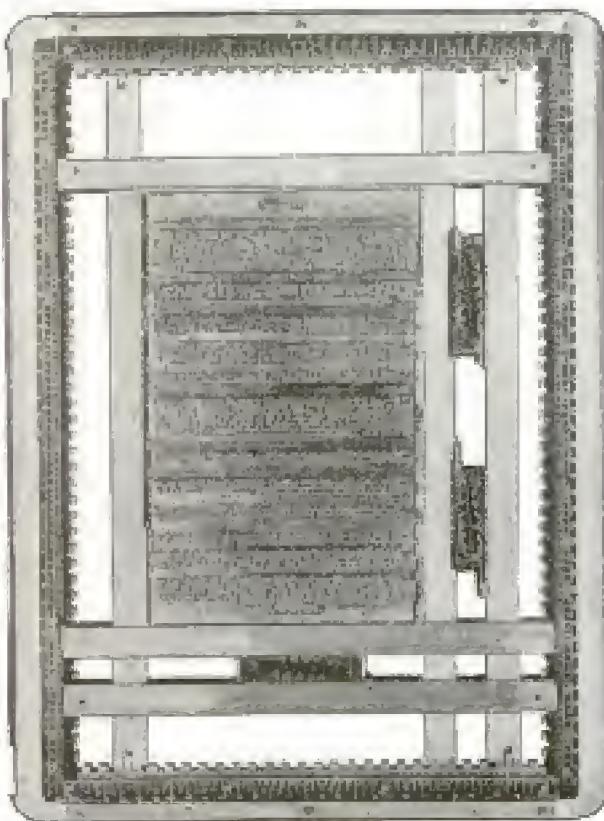
H. J. Hilland Co.
44 W. Beacon St.

688

POPULAR MECHANICS

8655
Chicago
PRINTERS' CHASE SIMPLIFIES
LOCKING UP FORMS

Time, labor, and material are saved in a newly patented printers' chase, which dispenses with the use of the usual printers' furniture cabinet, and eliminates



Printers' Chase That, in Locking Up Any Form, Dispenses with the Use of Printers' Furniture: Where the Quoins Are, One Bar is Locked, the Other Loose

roller bearings, as these are fitted onto each end of the chase itself, and can be removed by means of screws. Inside of the four sides of the chase are grooves that accommodate pica notches. In connection with these are bars that stretch from side to side, and end to end, of the chase, and can be moved into any position, and locked there automatically. Some of these bars are double, one being locked and the other loose, so that printers' quoins can be placed between them, and the loose bar be pressed against the type form. These bars are made of nickel-chrome steel and will not bend under severe strain.

8655
LARD OIL AS A LUBRICANT
VINDICATED BY SCIENCE

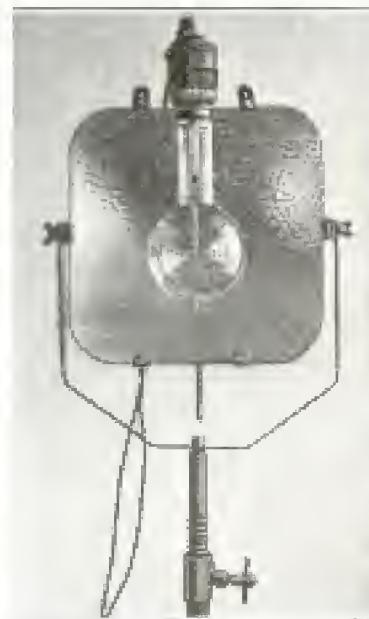
The belief of machinists that lard oil is superior to mineral oils in certain cutting operations, as on a lathe, has been regarded by many as a superstition. Studies of the subject made at the Bureau of Stand-

ards, the results of which have just been announced, show that the machinist is right and that lard oil is distinctly better for many purposes than mineral oil, in fact being well-nigh indispensable in certain cases. The need for lard oil has been previously discredited, as it was thought that the viscosity of the oil determined its behavior with cutting tools, and mineral oils, or mixtures of mineral oils, could be obtained with the same viscosity as lard oil.

It now appears that the lard oil has, aside from viscosity, the important characteristic of adhering more tenaciously to the metal than mineral oils, thereby preventing the tool from seizing the metal of the work, and causing it to drag and tear and make a rough cut. Lard oil is very useful in getting good clean surfaces in cutting soft steel and wrought iron, and also in tapping and threading. However, in hard brittle steel lard oil merely produces a glaze, and turpentine is used with success.

BRILLIANT LIGHT OBTAINED
WITH NEW REFLECTOR

Brilliant lighting effects can be obtained with the use of a new reflector having a concave silvered surface containing special indentations, which has recently been introduced in France. These indentations are said to increase greatly the efficiency of any lamp used, which, in public buildings or photographic studios, results in a high illumination at a comparatively low cost in the consumption of the electric current.

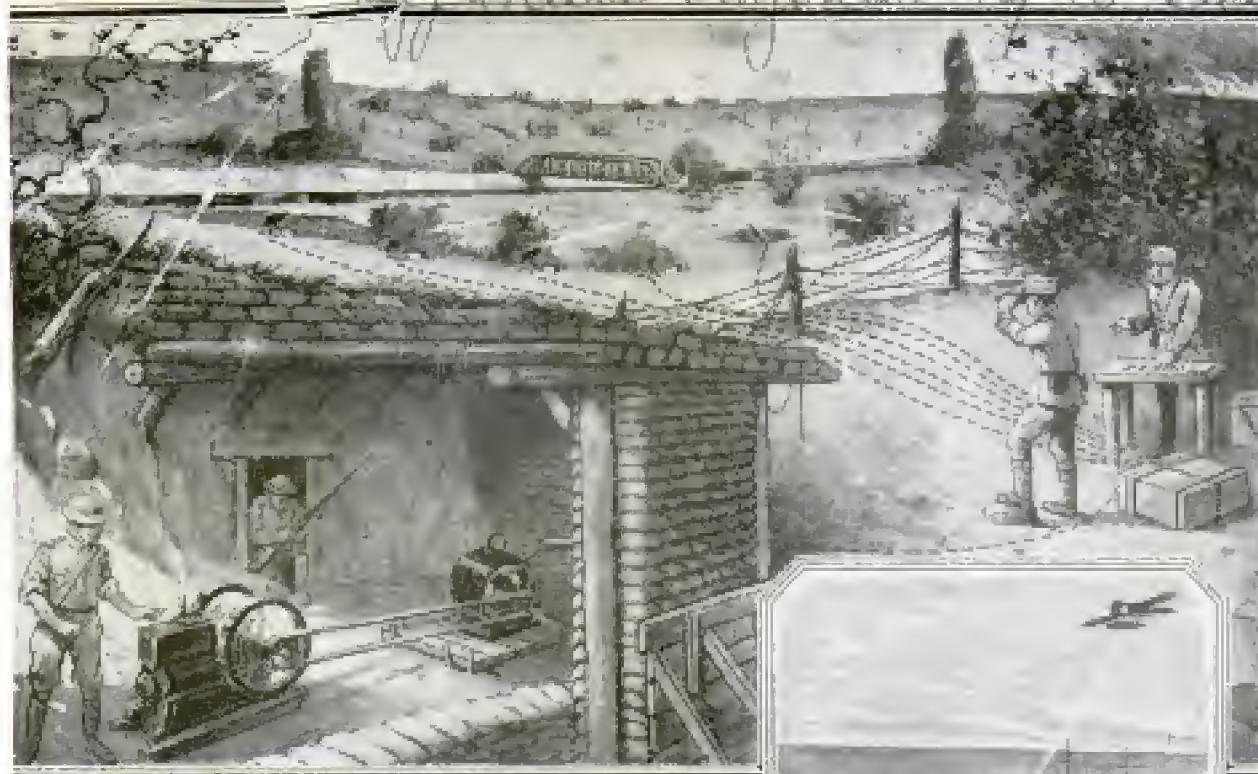


It is reported that concrete ships are now being experimentally built in Germany with the use of a floating iron shell instead of the usual wooden one. It is claimed that the new method is more rapid and less costly.

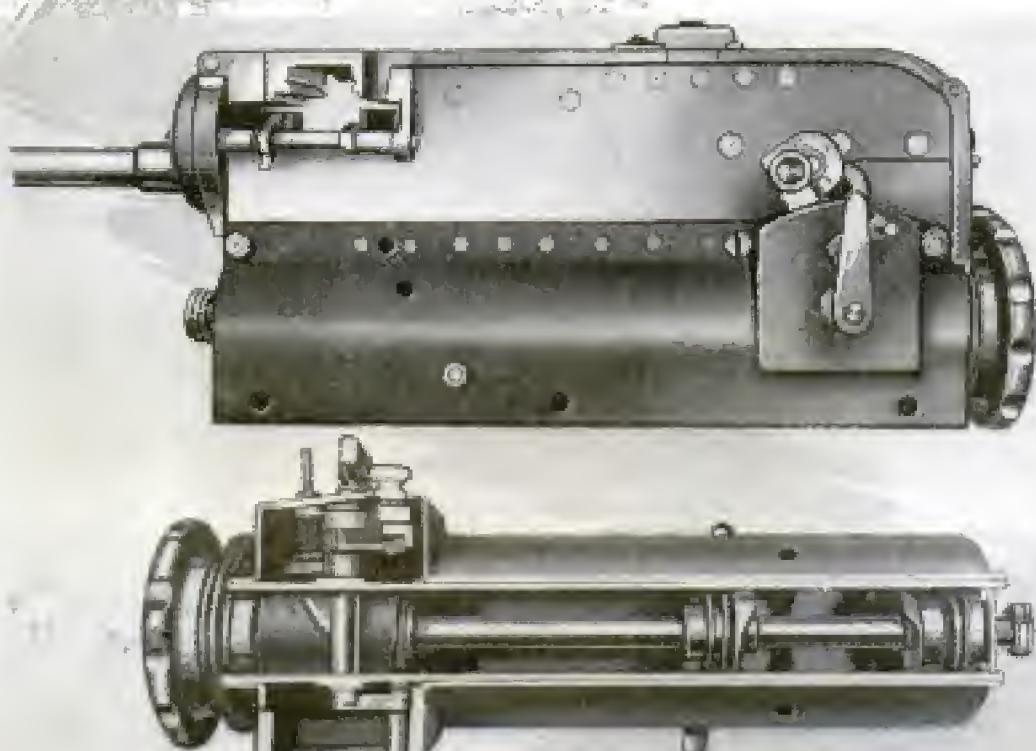
Civil C. A. Brug M. W. Washington Copy London
1521 Clark St. Ill. U.S.A. England
U.S.A.

8683 C. W. Speers, Vice-President

- Mfg. Steere Engineering Co., Detroit



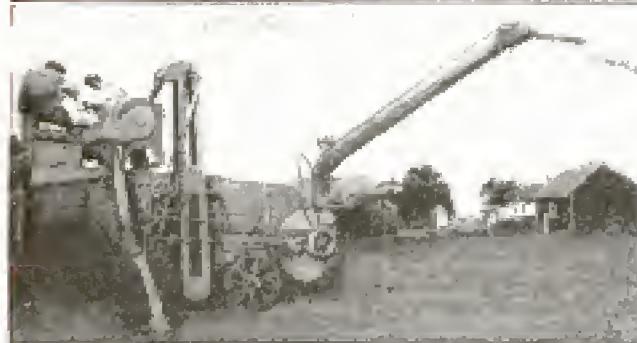
Power-Driven Machine Guns Shown Above Defending a River Crossing against an Assault of the Enemy: Batteries of the Guns in Emplacements are Operated by the Gunners from a Safe Distance in the Rear. Sheltered Power Station in the Foreground is Connected to Operating Base, Which by Wire Connections to the Guns Has Them under Complete Control. To the Right, One of These Guns is Shown on a Battleship's Conning Tower Doing Anti-Aircraft Work. Below: Side Elevation and Bottom View of Operating Gunbarrel in Experimental Gun, Built with Handwheel at Rear, Where Driving Sprocket would Be, and Showing Aperture for Cartridge Belt in Front of the Breech. The Water Jacket on the Barrel is Not Shown.



8653, Cont. & R. Winters
502 District National

POPULAR MECHANICS

Bank Bldg. 689
Washington, D.C.



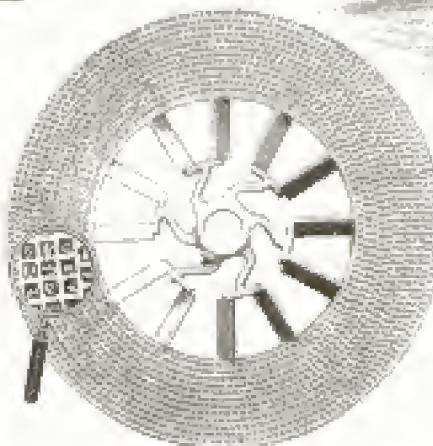
The Wheat-Cleaning Machine Is Light Enough to be Placed on Top of the Threshing Machine, and the Grain is Cleaned Before It is Shipped

MACHINE WILL CLEAN WHEAT AT TIME OF THRESHING

One source of economic waste has been the contamination of wheat by dirt and the seeds of various weeds and foreign grain, such as wild oats, buckwheat, and many others. Lately a machine has been designed and tested which seems to point to the solution of the problem of cleaning wheat at the time of threshing. It is of simple construction and can be placed on the top of the threshing machine, receiving its power from that source. In operation, the grain is fed into a horizontal cylinder in which are revolving disks provided with undercut pockets of such size that the dirt and foreign seeds are discharged at one point, while the cleaned wheat is discharged at another point. It is claimed that the separation is very satisfactory.

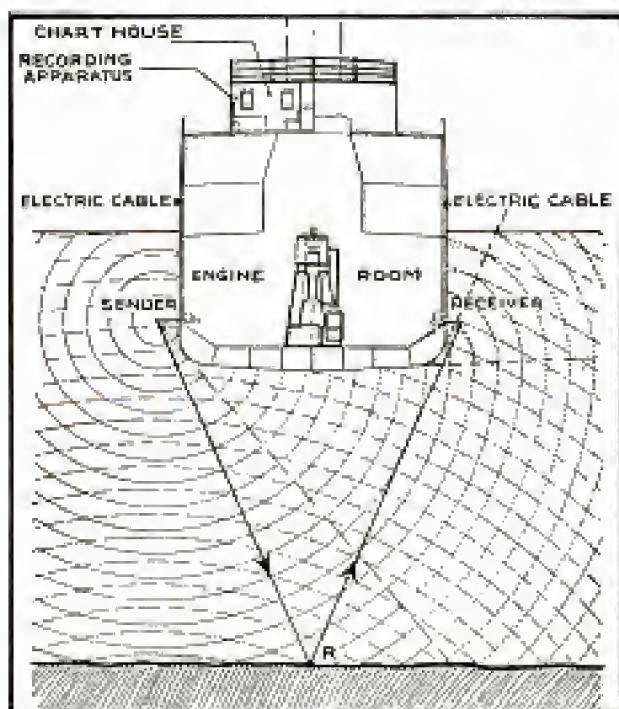
EMPLOY ECHO FOR MEASURING THE DEPTH OF THE OCEAN

The Navy Department has been working on a device for measuring ocean depths by means of reflected sound waves, but as yet has not perfected it to a point where it wishes to give out information regarding it. A recent German device of similar nature has been developed, by means of which depth measurements, accurate to within one foot, can be made even when the ship is moving at full speed. The principle, which has been applied previously, is very simple. A sound is made on the ship, the sound waves travel to the bottom of the ocean and are then reflected back to the ship. Sound travels in water at the rate of about 4,700 ft. per second, so all that is necessary is a suitable sending and receiving instrument with a means of measuring the time it takes for the sound to go and come back. The German apparatus is capable of recording a difference of $\frac{1}{10,000}$ part of



Above: A Phantasm View of the Machine, Showing How the Disks Revolve in the Grain. Below: Enlarged View of the Disks, Showing the Arms Which Move the Grain Ahead and Pockets Which Deliver It at the Proper Place

a second. The apparatus is tuned in such a way that the usual noises and vibrations of the ship in motion do not interfere with its operation.



When the Captain Wishes to Take a Sounding He Causes a Cartridge to be Fired at the Sending Instrument and Notes the Time It Takes for the Sound to Reach the Receiving Instrument. The Interval of Time Required for the Sound to Return Measures the Depth of the Water under the Ship

Cmt. Carl Cornmetz, Beermenehal Hanover
Lindenstr. 106. Germany.

Chas. H. Winsor
Palmyra, N.J.

630

POPULAR MECHANICS

Christian Science
Monitor 3/8

8696 PORTABLE RUBBER WASHBOWL FOR USE OF TRAVELERS

Insanitary conditions of hotel washbowls have caused the introduction of a portable bowl consisting of rubberized hospital sheeting. The material is pinched

between two metal loops, as linen is held in the rings of an embroidery frame. A telescopic frame enables the innovation to be fitted in any ordinary washbowl, and when not in use, it can be folded in a small flat leather case.

FRANCE PREPARES WONDERFUL TAPESTRY FOR AMERICA

875
For the purpose of commemorating America's entry into the great war and of further showing her appreciation of the assistance rendered, France is causing to be made a great tapestry which is to be presented to the United States. The tapestry shows in large figures the departure of American soldiers for France, and is wonderfully complete in details and coloring. In making the tapestry, the weavers are aided by sets of mirrors, one of which reflects all the details of the large painting which hangs behind the weavers, while another enables the workers to watch the results as the weaving proceeds.



Left: Portable Rubber Washbowl on Hotel Washstand.
Right: Washbowl Folded in Leather Case

7766 GERMAN AUTOMOBILE SHAPED LIKE A RAINDROP

Radical departures in automobile design have apparently not yet reached their limit, judging from a striking example of novelty presented by a car that caused a sensation at a recent auto show at Berlin, Germany. The principal aim of the designer was to construct a car with streamlines that would offer the least possible resistance to the air, and for that reason a falling raindrop was taken as an ideal model. Everything in the construction of the car was made subsidiary to this, and incidentally involved many striking novelties. The chassis is made of two wide pieces of pressed steel, under part of which there is a streamlined bottom of thin metal. The body, in both the open and limousine types, follows strictly the raindrop pattern. In both

cases the driver sits in front and the passengers behind, all the seats being in the center of the car between the two axles. The motor is at the back of the car just in front of the rear axle, and consists of six cylinders in three pairs, arranged radially, with the central pair vertical and the others at 60°. Normally it develops only 10 hp.—

all that is required to drive the car as a result of its slight air resistance. Behind the motor, in line with the rear axle, is the radiator, which is cooled by a powerful fan. The center of gravity of the car is very low, and it rides quite steadily with a chauffeur and two passengers, even at such a high speed as 75 miles an hour, recently attained on a race track.

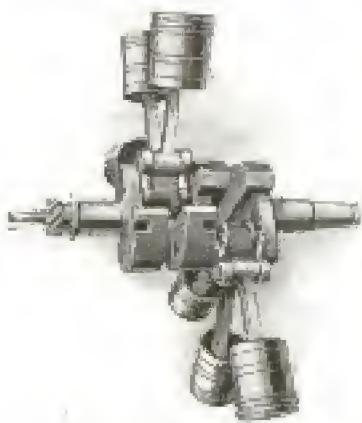


Rear View of Automobile with Ideal Streamlines,
Shaped like a Raindrop; The Motor is Located near
the Rear Axle Where Ventilator Openings are Seen

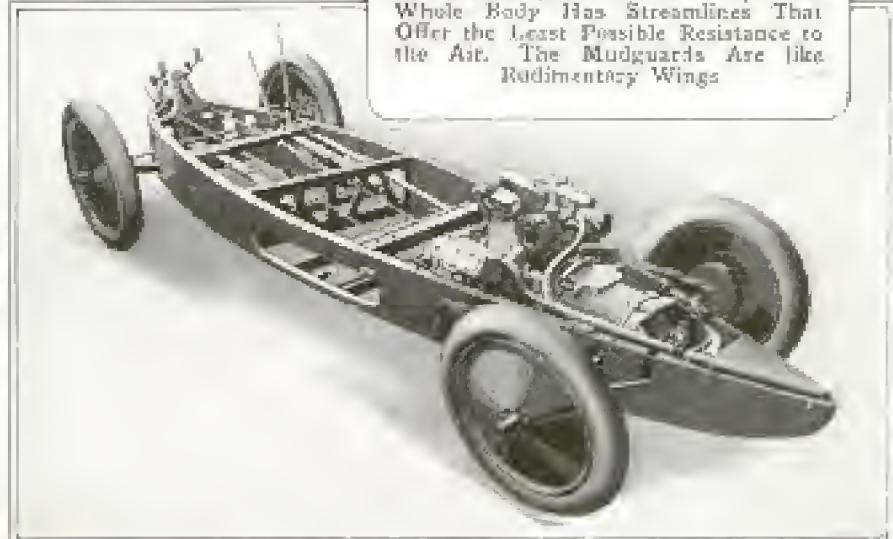
7768 Mfr. The Rumpfle Works
Berlin-Johannisthal Germany



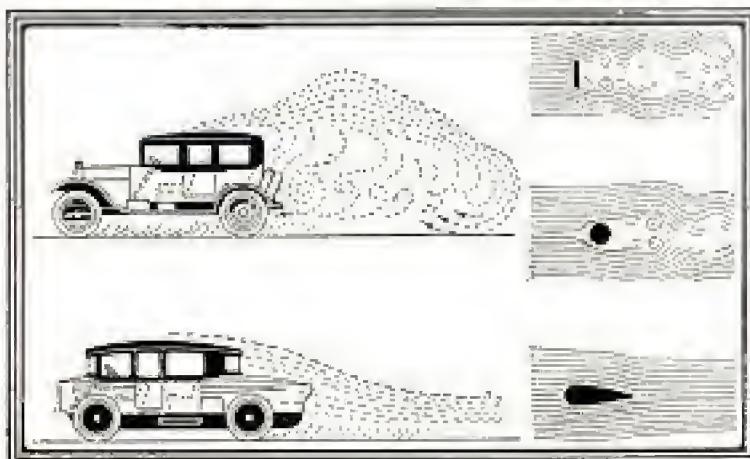
Side View of Limousine Type of Automobile Shaped like a Raindrop: The Whole Body Has Streamlines That Offer the Least Possible Resistance to the Air. The Mudguards Are like Rudimentary Wings



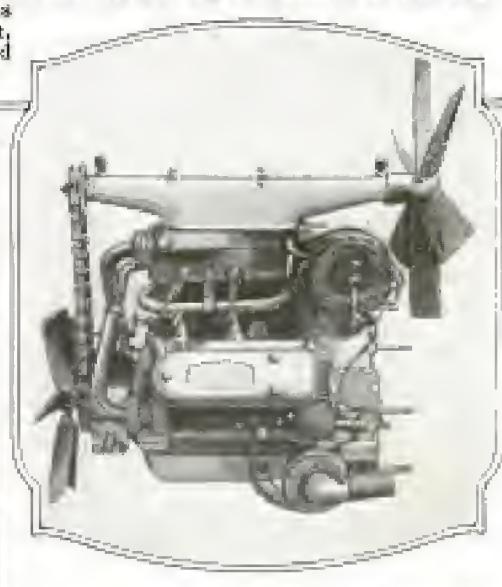
Crankshaft and Pistons of the Six-Cylinder Engine Built with Two Cylinders Vertical, and Two at 60 Degrees on Either Side of Them



Streamlined Chassis with the Motor and Its Driving Equipment at the Rear Axle, and the Controlling Pedals and Levers Seen at the Front, Where the Driver's Seat is Located



Reaction of the Air to the Ordinary Car, and to the Car Shaped like a Raindrop: The former, in Upper View, Causes Eddies like the Disk or Ball at Right, While the latter Disturbs the Air No More than the Raindrop at the Right



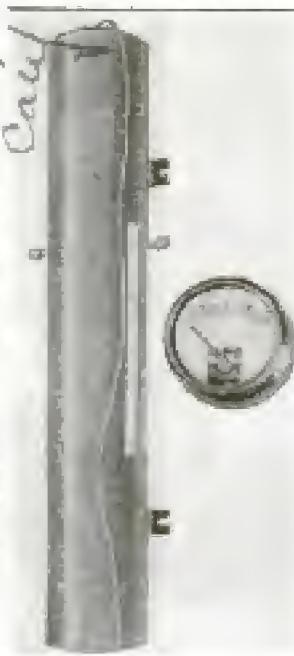
Power Plant of Raindrop Car on Rear Axle with Six-Cylinder Motor at Left and Radiator at Right, Which is Cooled by a Powerful Fan



Left: Front View of the Rice-Stripping Machine in Action, Showing How It is Pulled through the Rice Field by a Tractor. Right: Construction of the Stripping Teeth on the Cylinder of the Machine

8592 FLASH-TIMING ARRANGEMENT FOR MAKING RADIOGRAPHS

Instantaneous radiographs, or X-ray pictures, can be made with a new flash-timing apparatus



which has a range of from $\frac{1}{10}$ to $\frac{1}{2}$ second. The instrument consists of a hollow cylinder having a weight inside, which makes and breaks an electrical contact according to the way a small indicator is placed on the outside scale. After the indicator is adjusted on the scale for the desired time of exposure, the weight is pulled up toward the top of the cylinder,

until at a certain point it is automatically released. As the falling weight passes the indicator, a contact is made which opens a shutter for the exposure, and when the weight strikes the bottom of the cylinder, the shutter is closed.

8648 HARVESTER COLLECTS RICE FROM STANDING STALKS

A rice-stripping machine has been developed that marks a decided advance in the harvesting of rice. This machine strips off the rice while it is standing in the field, leaving the stalk and taking only the grain. This makes unnecessary cutting and threshing, which are the most expensive of the rice-harvesting operations. This stripper is equipped with a cylinder with six bars, on which are

mounted fingers, or teeth, of the proper shape for stripping the rice. Revolving as it moves along, the teeth of the stripper comb the rice from the straw and throw it up over the cylinder in the hood and drop it into a trough.

The grain is then conveyed by an elevator across to a platform, where the elevator empties it into sacks, which are tied, dropped off in piles, and finally picked up and hauled to the granary. This leaves the straw standing in the fields to be plowed under and used as fertilizer for the next year's crop.

This stripper, being mounted on, and attached to, one of the regular harvesting tractors, is able to work successfully in any rice field. When the rice comes from the stripper, it is from 60 to 80 per cent threshed clean off the stem; the other 20 to 40 per cent consists of blades, whole heads, and part heads that have been jerked off with the rice grains still intact. This rice must be carried through some cleaning process to get it ready for the granary or for the market.

608

SIMPLE BOOKHOLDER MADE BY BENDING IRON WIRE

Bending a piece of iron wire to make a simple bookholder is the idea of an Indiana inventor. The holder consists of



a wire with an eye bent in the center for a screw, and with two arms bent at right angles to rest upon the book. The whole arrangement is

screwed to the back of the school-desk upright, and the tension of the wire holds the arms flat against the pages. The device is patented.

O. B. Sandifer
North Manchester, Ind.

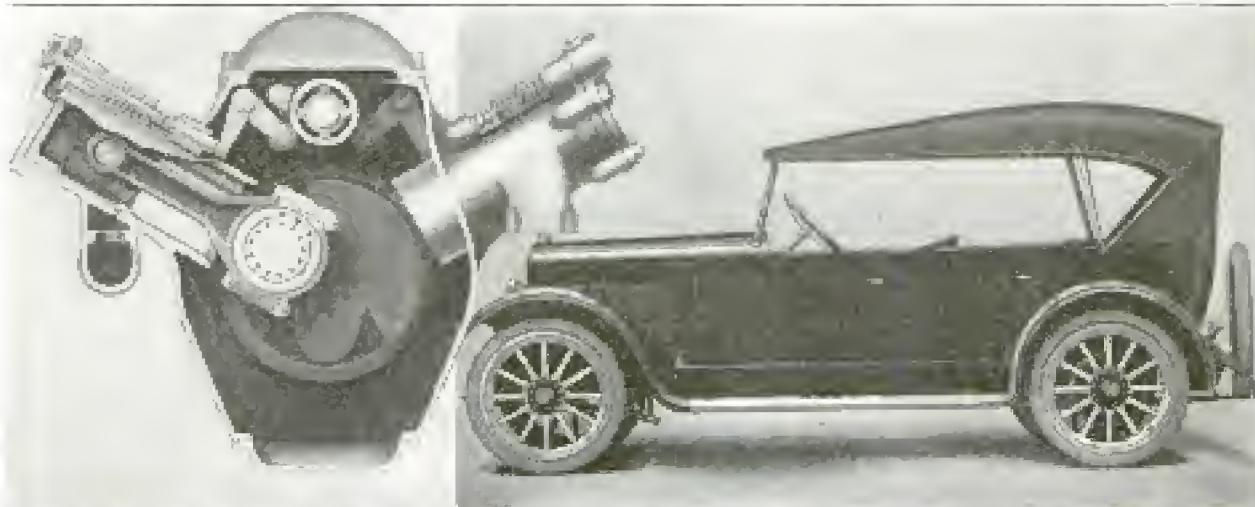
*Coates & Steamer Co.
merchants Bank Bldg.
elation POPULAR MECHANICS*

8700

693

STEAM TOURING CAR SIMILAR IN FORM TO GASOLINE CAR

Past experience with steam cars has shown that, while some would operate as economically, it has been difficult to manufacture them at as low a first cost as equivalent gasoline-engine cars. Built in many respects on the lines of a gasoline car, there is now being constructed a commodious steam touring car which the manufacturers expect to be able to market for about \$1,000. Viewed externally, it is difficult to distinguish it from any ordinary gasoline car. The hood is exactly similar, with what appears to be an ordinary radiator, but is, as a matter of fact, the condenser for the exhaust steam from the engine. Immediately behind this is the boiler, which supplies superheated steam at a pressure of 600 lb. It operates intermittently, its fire box being a mixing chamber for air and kerosene forced into it by motor-driven pumps, and ignited by a spark plug, all of which are on an electric circuit, which is automatically broken when the pressure reaches 600 lb., and closed when it drops below that pressure, or by a switch operated by hand in starting. The engine—of the V-type—located behind the boiler, has three cylinders, one on one side, and two on the other, with poppet valves operated by cams. In combination with the engine is a two-speed and reverse transmission. Power is transmitted to the rear axle by the usual propeller shaft. At the driver's seat are gear-shift and emergency-brake levers, with a service-brake pedal, and another for controlling the steam cut-off. Directly below the steering wheel is the throttle for speed control. The weight of the car fully equipped is 2,250 pounds.



Steam Touring Car That Is Indistinguishable in Appearance from a Gasoline Car, and can be Manufactured Very Economically; What Looks like the Radiator Is the Steam Condenser, and under the Hood, besides the Boiler, Is the Three-Cylinder V-Type Engine. Shown to the Left on an Enlarged Scale

POLICEMEN IN EGYPT CARRY SHIELDS FOR PROTECTION

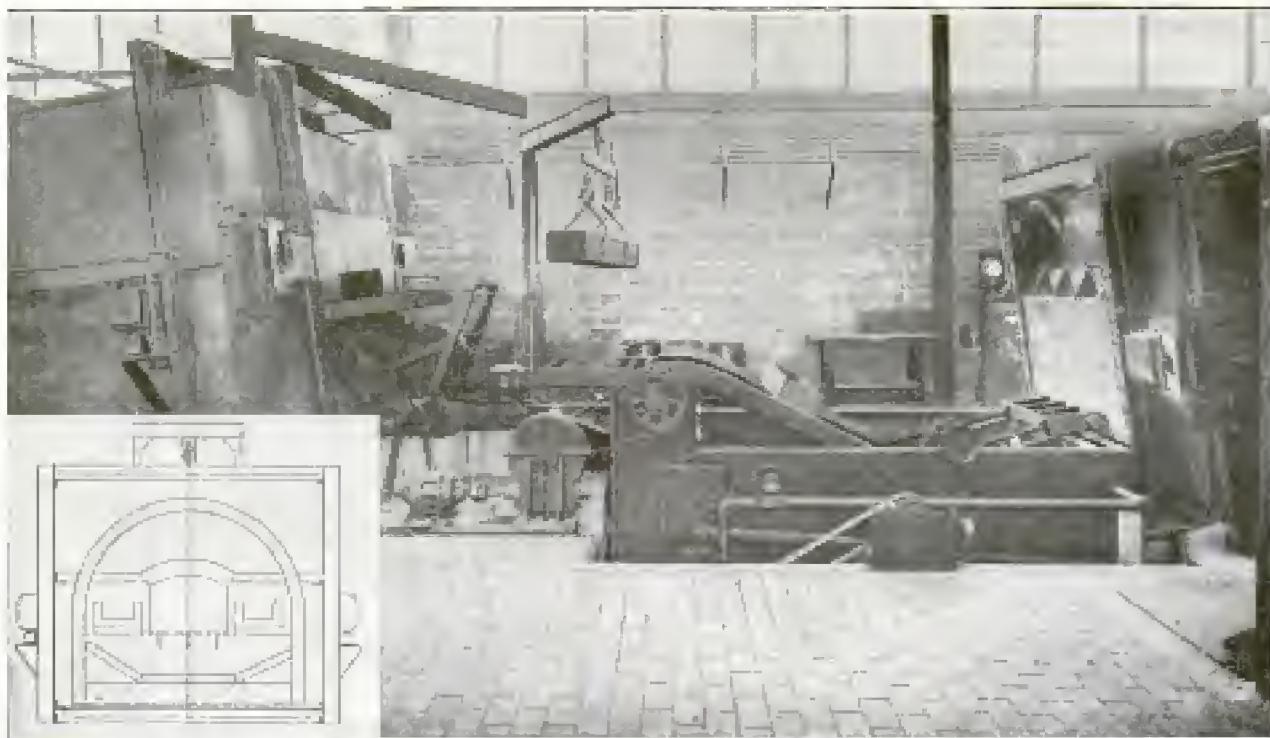
Broken bottles, stones, etc., are the favorite weapons of rioters in Egypt, and



Wide World Photos
Left: Egyptian Policeman Ready for Action with Club and Shield. Right: Carrying Shield When Not in Use

to protect the police from these crude barrages, they have been furnished with shields. These are of woven-reed material, and when not employed in warding off flying missiles of a miscellaneous character, are carried on the back by the policemen.

Ghostly materializations of a Danish medium aroused such widespread interest that scientists of Stockholm, Sweden, decided to verify the performances. During a seance, when a "soul" was projected outside of a body, a photograph showed that the filmy emanation was nothing but a piece of chiffon.



The Steel Parts Co. Automatically, through the Hardening Furnace at the Right, the Quenching Tank, in Center, and the Annealing Furnace at the Left. The Insert Shows the Interior Arrangement of the Furnace.

ECONOMICAL FUEL PUMP FITS ANY BARREL OR DRUM

Price Pump
Farmers can have their own miniature filling station if use is made of a pump placed on the market by an Illinois concern. The pump is made entirely of brass, insuring durability, is adjustable to fit any size wooden or steel barrel, or drum, and has a capacity of 5 gal. per minute. Preventing the evaporation or spilling of the fuel, and eliminating all danger when filling the tanks of motor cars or tractors, are additional features of the product.



This Fuel Pump Fits Any Steel or Wooden Barrel, and Prevents Waste.

AUTOMATIC ELECTRIC FURNACE FOR TREATING STEEL PARTS

It has long been known that the proper heat treatment of steel is a big factor in determining the strength and wearing qualities of the piece treated. This is of particular importance in the automobile industry. Up to date, heat treatment has been practiced in various kinds of furnaces, but always under the supervision of skilled operators equipped with the most delicate instruments for measuring time and temperature. Now, however, an automatic electric furnace, installed at a Michigan automobile plant, has been devised in which the parts to be treated move through the different processes on a predetermined schedule. The parts are loaded in metal baskets and pass through the hardening furnace to the quenching tank, thence to the drawing furnace. The mechanism is set so that the parts undergo each step of the treatment exactly the required period of time.

GREAT BRITAIN NOW ABANDONS DIRIGIBLE AIRSHIPS

It is announced that Great Britain is to scrap her aerial navy, as far as the large dirigibles are concerned. The action is partly the result of the desire for economy and partly because of the disasters to the two great airships, the "ZR-2" and the "Roma," with their consequent loss of

cont. Marjorie A. Ruff
8676 120 Langdon St.

POPULAR MECHANICS

695

life. The equipment at the large airship bases is to be dismantled and sold at scrap prices. This action means the abandonment of plans to link up the empire aerially.

NEW TIE-CHANGING MACHINE RAPID AND ECONOMICAL

Replacing railroad ties reaches a yearly average of more than 10 per cent of the total number in the roadbed, and a machine has been developed that will do this work at a cost of .4 man-hour per tie, instead of the old rate of 1.2 man-hours. In operation, the apparatus is placed across the rails, and a ratchet arrangement with handles works back and forth upon it. Attached to the ratchet is an anchoring chain and also a steel pulling cable, the latter terminating in a special clamp which is fitted over the end of the tie. After the spikes and tieplates have been removed, the clamp is fastened on and the worn-out tie pulled from under the rails without disturbing the roadbed. Where there is but a single track, the new tie can be pulled in without moving the machine, but with a double-tracked right of way, it must be reversed so as to pull the tie in from the "ditch" side,



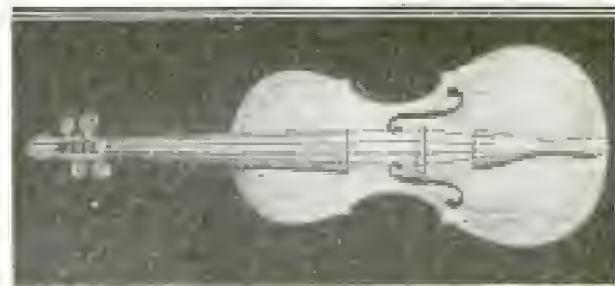
Tie-Changing Machine. Showing the Ratchet Arrangement in the Center, the Pulling Cable at the Left, and the Special Clamp under the Right End of the Frame. The Inset Shows the Anchoring Chain.

Owen - Pennsylvania Corp. on
Wilkes-Barre, Pa. Copyrighted material

VIOLIN MADE OF MATCHES

TOOTHPICKS, AND GLUE

When a person speaks of violin making, it brings to mind thoughts of the finest wood, thoroughly seasoned, and carefully worked to the proper dimen-



This Violin is Composed of More Than 13,000 Matches and Toothpicks

sions. That this is not a necessity, is shown by a patient worker who has made a violin entirely out of matches and toothpicks glued together and fashioned to the proper thickness. In spite of the unusual material used in its construction, the violin has a soft mellow tone, said by experts to be of good quality and volume. It seems remarkable that a violin constructed in this way should stand the strain and vibration of being played upon.

8480
15.00
25.00

TYPEWRITER STUDENTS AIDED BY "FLASHBOARD" MACHINE

Typewriter students have been greatly aided by the introduction of a flash writing machine which furnishes an easy



Machine for Typewriter Students, Showing the "Blind" Standard Keyboard Below and the Lettered "Flashboard" at the Top with the Shutters

method of visualizing letters and words on a keyboard. The apparatus has a "blind" keyboard with the standard number of blank keys on it, and in place of the usual set of type, has what is called a "flashboard." This flashboard also is equipped with the standard layout of letters, signs, etc., each having a white spot under it, but which is concealed by a small shutter. When a key is struck, the shutter beneath the corresponding letter or sign is drawn down for an instant, exposing the white spot. The beginner thus forms a mental picture of the positions of the different letters and soon becomes adept in "seeing" entire words, all of which helps in the development of speed.

8614 — *Access*

AUTOMATIC JACK CONTROLLED FROM AUTO DRIVER'S SEAT

With a new device consisting of four jacks permanently attachable to any car



Automatic Jacks Permanently Installed. One at Each Wheel, Operated by Power from the Engine, and Controlled from the Driver's Seat: The Lift Is 5½ Inches



8614 — *Access*
C. W. Phillips
Dept. of Engineering
U. S. Patent Office
Washington, D. C.

—one adjacent to each of the wheels—an automobile driver can jack up any one or all of the wheels without leaving his seat. The jacks are operated by power from the engine, transmitted either from the flywheel or the pump shaft. Four levers near the driver's seat furnish the means of control. The jacks have a maximum lift of 5½ in., and are powerful enough to lift any load that the car is capable of moving. Tire changing will thus be greatly facilitated, and the jacks will make it easy to take the load of the car off all the tires when not in use, thus greatly adding to their length of life.

8656

LAND ELEVATIONS OF NATION SHOWN IN WATCH CHARM

An unusual watch charm, which is representative of the extremes of land elevations within the continental limits of the United States, has been made by a western man. The charm consists of three pieces of polished stone picked up in California: one from Death Valley, symbolical of the lowest point below sea level; one from Redondo Beach, to represent sea level, and one from the summit of Mt. Whitney, being emblematic of the highest point of land. These are set in a gold mounting which bears an engraved description of the three layers of mineral, the whole serving as a pleasing reminder of the owner's visits to the different localities.



8724 — *Rainy Day*

USE WEATHER CHART TO SAVE MONEY WHEN PLACING TIES

That rainfall charts may be used as money savers was recently shown by a railroad wishing to place ties it had on hand which had been treated with zinc-chloride preservative. The ties treated with this zinc salt are satisfactory in dry climates, so a map was prepared showing portions of the line where the rainfall was relatively small, and the ties were used at these points, while creosote-treated ties were used at points subject to heavier rainfall.

Dept. Agriculture
Press Club Blue
195



MOTORBOAT TRAVELS OVER SNOW-COVERED HIGHWAYS

BUFFETING through snowdrifts in a motorboat was the strange experience of three men who made a 70-mile trip over the highways to deliver the purchased craft to its owner. The boat, which was ordered built for pleasure purposes on a Maine lake, is 40 ft. long, 8 ft. 6 in. wide, 3 ft. 6 in. deep, has an oak frame with cedar planking, and weighs two tons. Two 24-hp. gasoline engines will drive two propellers, to yield a speed of 18 knots (20½ miles an hour). In making the journey from the boat works to the buyer, the craft was mounted on ordinary toboggans and pulled by a one-ton tractor.

8674

WILD ENGINE MAKES PLUNGE INTO TURNTABLE PIT

Running wild, an engine in a roundhouse of the Southern Pacific Railroad steamed out of the building and plunged into the turntable pit, causing \$1,750 damage. Men were working on other engines in the immediate vicinity, when suddenly the large locomotive was seen to move and



Workmen Raising the Runaway Engine upon Blocks Preparatory to Taking It Out of the Turntable Pit: The Damage to the Cab of the Engine can be Plainly Seen



Runaway Engine Shown in Turntable Pit Immediately After It had Made the Disastrous Plunge

gather headway, but with no one visible in the cab. After due investigation, the board of inquiry appointed by the company reported that an unknown person, or persons, had opened the throttle and started the engine on its disastrous journey.

Cont. A. A. Stifford, Reno, Nevada

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Benj. P. Forbes Chocolate Co., 409 Superior Ave., N.W.
Cleveland, Ohio

698

POPULAR MECHANICS

NEW FRUIT-JAR WRENCH GIVES FIRM GRIP

835
Anyone who has struggled with an obstinate fruit-jar cover will appreciate a wrench recently devised. The wrench is

so constructed that the harder one pulls on the handle, the tighter the wrench grips the top of the jar, the handle giving sufficient leverage to start the tightest top but, because of the shape of the jaws, there is no danger of spoiling the cover or the jar. The wrench is made of stamped metal and combines lightness and strength.

CHALLENGER IN FISHING-BOAT RACE IS LAUNCHED

85/10 The American fishing schooner "Puritan," prospective challenger for the international trophy won by the Nova Scotian craft "Bluenose" in a contest last fall against the "Elsie" of Gloucester, Mass., was launched on March 15 at Essex, Mass. More than 1,000 persons witnessed the launching, despite the fact that the shipyards in which the schooner was built are in a remote community.

The "Puritan" was christened by Miss Grace Adams, of Malden, who, with Capt. Jeff Thomas, master of the craft, rode into the stream on the vessel. Although after sliding down the ways, the stern of the schooner fetched up against the oppo-



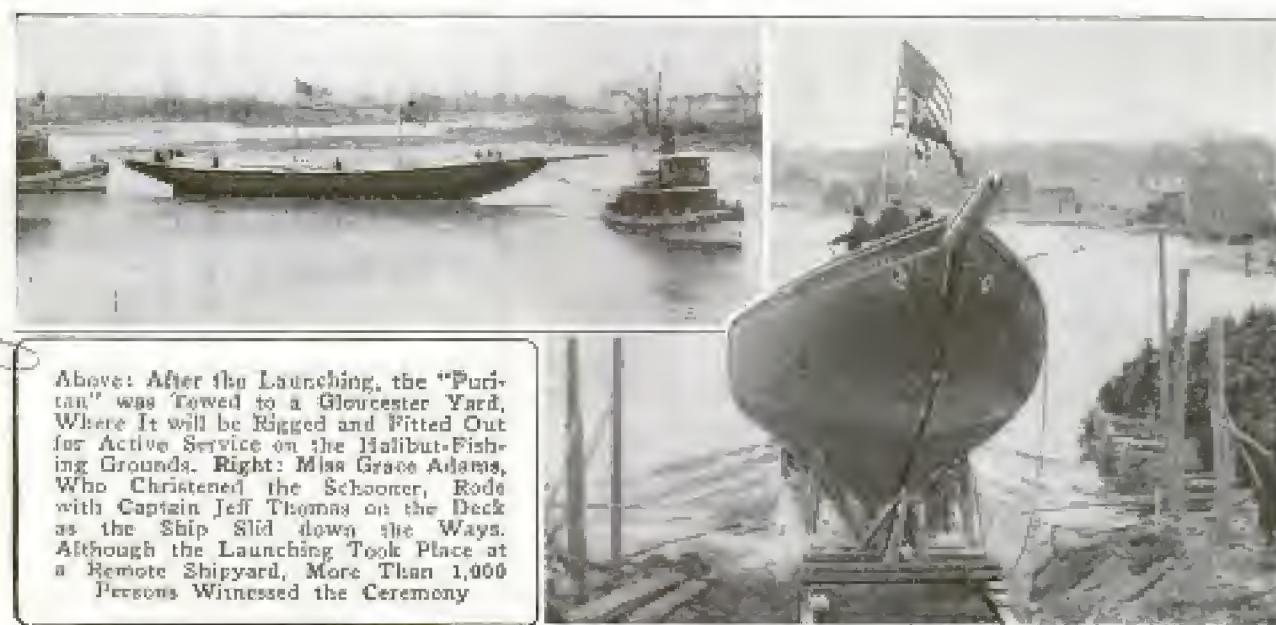
wire bank of the narrow Essex River, no damage was done. The craft is financed by the Manta Club, an organization of some 16 Gloucester men, formed to make efforts to put a schooner into the water capable of bringing back the international trophy to the United States.

Following the launching, the "Puritan" was towed to Gloucester, where it will be rigged and fitted out. Then it will leave, under Captain Thomas, for the halibut-fishing grounds for active service until the elimination races off Gloucester next October to pick the American challenger.

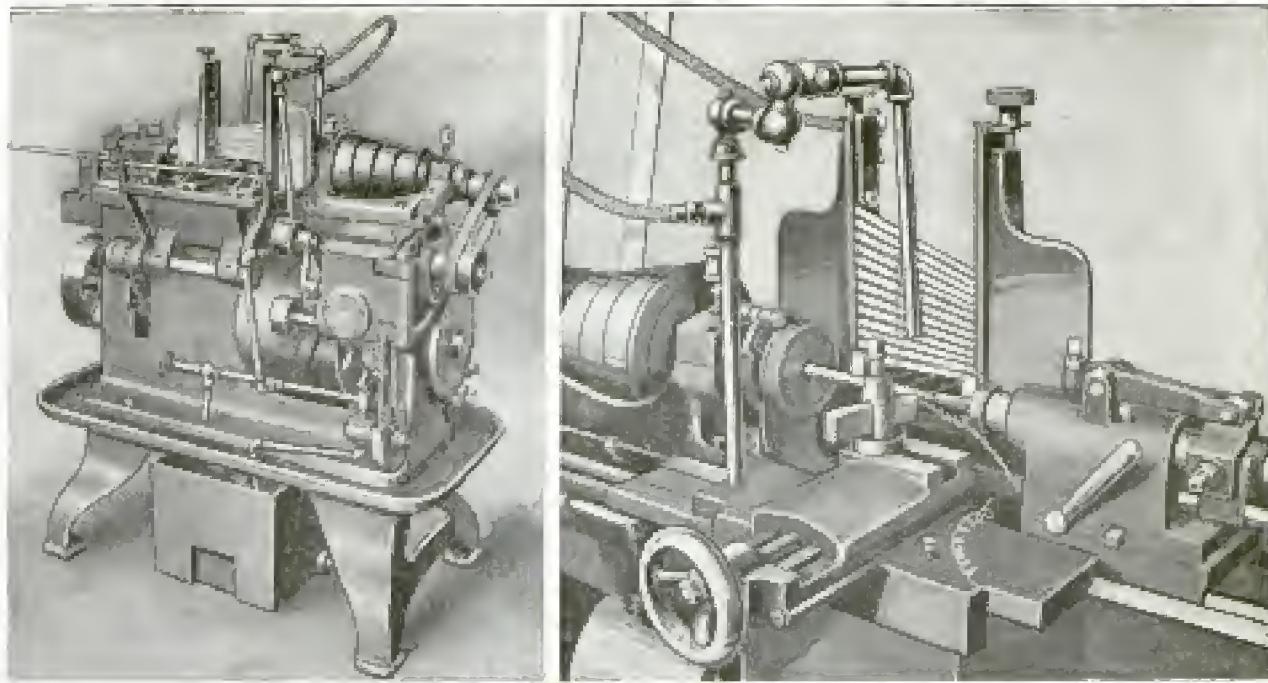
In the elimination races the "Puritan" may meet the Boston schooner "Mayflower," which was ruled out of the international contest last fall by the Canadian authorities on the ground that it was more of a yacht than a practical fishing schooner. The "Mayflower" has been actively engaged in the fishing industry for nearly a year, and quite probably will be allowed to enter the elimination contests.

Another schooner, of Boston build, is scheduled to enter the elimination tests. Plans call for its completion the latter part of April. It has been tentatively named "Uncle Sam." A group of Gloucester men arranged for its construction.

The "Puritan" is well within the regulations governing the international trophy competition. Its over-all length is 138 ft., water line 107 ft., beam 25.2 ft., depth of hold 11.91 ft., and draft 14.6 ft. It has a gross tonnage of 149. The construction throughout is that of the ordinary deep-water fishing craft. The bowsprit is 12 ft. outboard. It is approximately 20 tons lighter than the "Mayflower," and from deck to main topmast measures 10 ft. less in height.



Above: After the Launching, the "Puritan" was Towed to a Gloucester Yard, Where It will be Rigged and Fitted Out for Active Service on the Halibut-Fishing Grounds. Right: Miss Grace Adams, Who Christened the Schooner, Rode with Captain Jeff Thomas on the Deck as the Ship Slid down the Ways. Although the Launching Took Place at a Remote Shipyard, More Than 1,000 Persons Witnessed the Ceremony



Left: Rear View of Automatic Engine Lathe. Tank below Lathe Holds Supply of Cooling Compound, Which is Conveyed to the Work by Chain-Driven Gear Pump Seen at Right of It. Right: Close-Up, Showing Lathe at Work, with Magazine at Rear Half Filled with Cut Lengths of Bar Stock

7876 NEW AUTOMATIC ENGINE LATHE FOR QUANTITY PRODUCTION

Engine lathes, entirely automatic in their action, taking the work from a magazine, gripping it and setting it up, and ejecting the finished piece, all without any attention from an operator, are now on the market. The machine is designed for quantity production, handling cut lengths of bar stock or forgings that must be turned on centers. All the operator has to do is to replenish the magazine, and keep the cutting tool in proper condition, and, therefore, he can attend to a number of machines simultaneously. In general, the machine resembles a common engine lathe, but in place of the lead screw is a drum cam for the carriage traverse. This cam has adjustable dogs which may be arranged to produce the required length of cut. In operation the carrier, connected with the magazine, moves forward, presenting the work in alignment with the centers. The tailstock center then moves up and pushes the work between the jaws of the driver, or chuck, and then the carriage moves the tool to the cutting position. At the end of the cut the tailstock spindle is withdrawn, the chuck is opened, and the work dropped out.

The Canadian Pacific Railroad is to resume work on its new ocean pier at Vancouver, B. C., which, together with the Ballantyne pier, will provide 10 additional steamship berths.

CAUSES OF FAILURE OF ROOF OF WASHINGTON THEATER

An investigation of the causes of the failure of the roof of the Knickerbocker theater, in Washington, D. C., when 97 people were killed and 135 injured, has been made by a committee of the Washington chapter of the American Association of Engineers. The committee consisted of N. D. Mitchell, chairman, and W. G. Noll, L. M. Neel, W. A. Slater, and J. A. Cliff. The features of the theater building that most deserve criticism, according to the report of the committee, were nine in number, as follows:

1. Support of main truss on a thin wall lacking solidity and mass.
2. Support of main truss on a skew bearing, combined with lack of stiffness in connection between the end post and lower chord of truss.
3. Failure to anchor trusses and heavy beams into walls.
4. Scant bearings at walls.
5. Insufficient section areas, and inadequate details of truss members.
6. Inadequate column bracing.
7. Absence of lateral support of intermediate panels of a main truss.
8. Absence of diagonal bracing between other trusses.
9. Inadequate strength of roof slab.

The committee expressed the opinion that every one of these nine items required correction to make the building safe, but that the correction of the first three alone would have postponed the failure of the roof. The conclusion drawn by the committee was that the construction of this building violated the building laws of the District of Columbia in many respects.

Cont. Chas. A. Isoddard and M. E. Armstrong
5626 d Irvington Place Austin, Minn.

700 Los Angeles

POPULAR MECHANICS

Minn.

THIRTY-YEAR-OLD BICYCLE
WITH WOODEN FRAME

At first glance a person would say that there was nothing strange about an old bicycle found in a Los Angeles shop, but



Nine Strips of Hickory Wood were Used in Making This Bicycle Frame, but They are So Skillfully Joined That It Has the Appearance of One Piece

a closer inspection shows that the frame and forks are made entirely of hickory wood. Built 30 years ago when steel frames were very massive, this bicycle weighed 10 lb. less than the standard machine of those days.

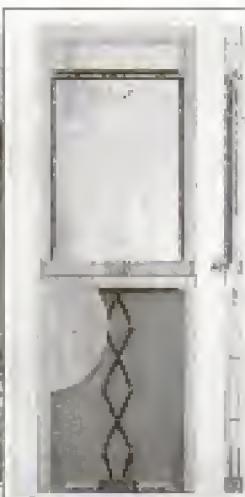
PRACTICE CHART OF KEYBOARD
ON TYPESETTING MACHINE

So that persons who are studying to become typesetting machine operators may practice at home, a copyrighted chart has been prepared which shows all the characters of the standard keyboard and

the location in which they occur. In use, the chart can be fastened to a board or table top, which should be inclined to form about the same angle as the regular keyboard.

6491
FRAMELESS WINDOW REPLACES
SHIP'S CIRCULAR Porthole

A notable feature of the modern passenger ship is the change from the old restricted circular porthole to a square type of window of generous proportions. The improvement is comparable to the change ashore from the old diamond pane to the balanced window sash. But, of course, at sea the ordinary framed window sash will not stand the exposure to spray and rain, where water-tightness is essential, without constant care and attention. For this reason a frameless window has been devised which consists entirely of thick plate glass with well-smoothed edges. The windows are now being installed quite extensively in ships built in England. They are used in all deckhouses, charthouses, and on the bridge. The window is a highly polished sheet of glass, its finished edges sliding in brass guides, thickly lined with felt. A handle is fixed at the top of the window, with which it is raised or lowered. It rests upon a double set of levers, hinged together so as to move in and out, on the well-known lazy-tong principle, the lower end terminating in a spring box in which the springs are so designed as to balance the window in any position. This is all housed in the wooden framing below the window, and at the top of the framing is a small brass handwheel which acts upon the guides so that they hold the window tight against vibration and leakage.



Balanced Frameless Ship Windows, Shown in Two Deckhouses, Illustrating Their Superiority over Old-Fashioned Round Portholes. In the Center Are Sectional Views Showing Balancing Arrangement on a Double Set of Levers, like Lazy Tongue. The Small Handwheel above the Levers Tightens the Window to Prevent Vibration.

Becket, Laycock, & Watkinson
Willisden, London, N. W. England
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8608 Cont. H E Thomas

911 Bunchley Ave.

POPULAR MECHANICS

501

Portland Oregon



Waterworks Project. Showing the Dam Which Controls the River; Beginning at the River Just above the Dam can be Seen the Canal That Leads to the Screen House. From the Screen House the Water is Carried through a Narrow Channel Leading to the Pipe Lines

8608 ABSOLUTE CONTROL OF RIVER WITH WATERWORKS DAM

Controlling an entire river has been achieved by engineers of a waterworks project which supplies Portland, Ore., and which was lately completed about 20 miles east of that city. By means of a dam, 30 ft. high, the water is caused to pass through a canal, 30 ft. wide, 10 ft. deep, and 200 ft. in length. This canal has a screen house built upon it for removing gravel, or any other foreign matter, from the water, and leads to a pond from which are laid huge pipe lines to the reservoirs of the city. Besides giving absolute control of the water and eliminating the débris, the undertaking furnishes an additional 30-ft. head on the waterworks system.

P668

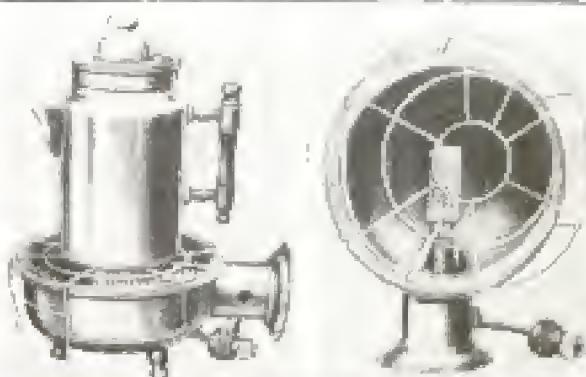
ALIENS TO BE DEPORTED MAY BE HELD FOUR MONTHS

According to a decision recently handed down, undesirable aliens to be deported may be held by the authorities only four months. If action is not taken within that time, the alien may obtain his freedom on the grounds of "unlawful imprisonment."

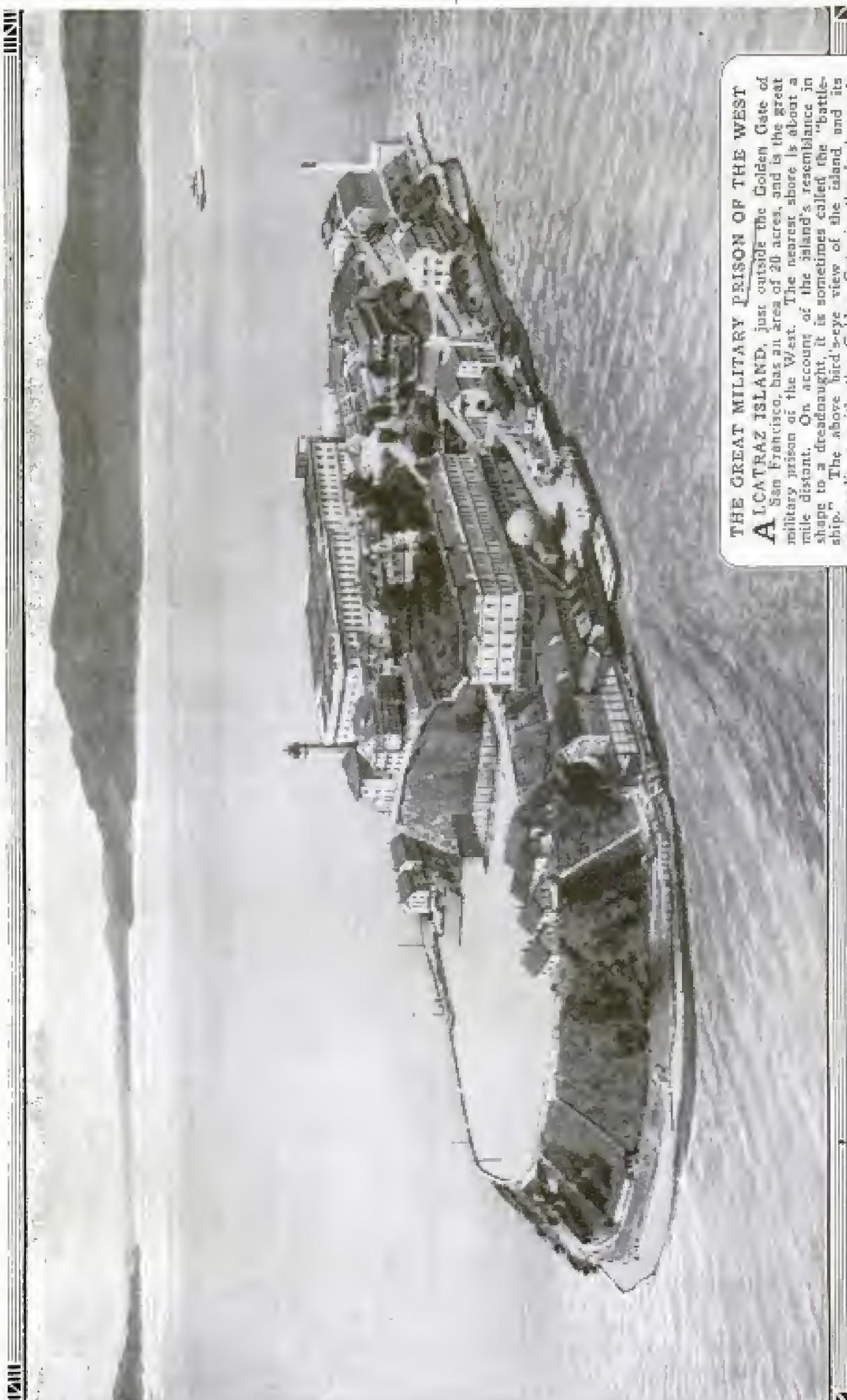
St Louis Post-Dispatch J. Roberts 270
1/3/22 W. 39 St New York City
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8608 SMALL ELECTRIC APPLIANCE
POSSESSES MANY MERITS

Frying eggs, toasting bread, boiling water, or making coffee, and providing better illumination, are several of the uses to which a small electric heater may be put. The appliance weighs but 3 lb., is finished in polished copper or nickel-plate, and has a screw-type element of 615-watt capacity, which can be removed for interchanging with a 15-watt lamp. An adjustable spot-welded guard is furnished with the outfit, so that different articles can be placed at varying distances above the heating element.



Left: Small Electric Appliance being Used to Heat a Coffee Percolator. Right: Same Appliance being Used as an Ordinary Heater



THE GREAT MILITARY PRISON OF THE WEST

ALCATRAZ ISLAND, just outside the Golden Gate of San Francisco, has an area of 20 acres, and is the great military prison of the West. The nearer shore is about a mile distant. On account of the island's resemblance in shape to a dreadnaught, it is sometimes called the "battle-ship." The above bird's-eye view of the island and its surroundings, with the Golden Gate in the background, was photographed from an airplane.

8392 Emb. William R. Reincke
184 De Kalb Ave.

POPULAR MECHANICS

**ASBESTOS INSULATING MATS
HAVE MANY ADVANTAGES**

Asbestos mats as insulating coverings for boilers, steam cylinders, turbines, and similar machines, have been used for the last 20 years almost everywhere excepting in the United States, which is somewhat surprising considering their advantages. These mats, made preferably of South African blue asbestos, contain neither wire nor cotton carrier, and have great strength and durability. Their great advantage is the ease and rapidity with which they can be fitted as a cover for an object of very irregular shape, such as a locomotive, in which 10 or 15 strips of matting will do the work

better, and in far less time, than with the ordinary block sections. These mats can be made in very large sizes, indeed in any size desired. The fiber filling possesses great strength and lightness.



Locomotive, with Its Irregular Surface, being Covered for Insulation with Extremely Flexible Asbestos Mats, Making the Work Easy and Rapid: The Work can be Completed in Much Less Time Than with the Usual Lagging



After the Sick Animal is Placed in the Box and the Air-Tight Cover Closed, the Anesthetic is Forced In by Means of the Bellows

**ANIMALS ANÆSTHETIZED
IN SPECIAL CHAMBER**

In a well-conducted zoo the animals receive the finest treatment, and, should one of them fall ill, it is examined by medical experts. In case an operation is deemed necessary an anaesthetic is administered in a special chamber designed for the purpose. This is a stout box fitted with an air-tight cover, and with windows at the sides and in the top, through which the condition of the patient may be noted as the anesthetic is forced in by the bellows until the proper comatose condition is reached.

**GASOLINE GRADER CUTS
EIGHT-INCH TRENCH**

For the use of contractors and highway engineers, a machine has been devised to take the place of some of the pick and shovel gang. It is a motor-driven trench cutter and can be steered to follow a chalk line. At the side of the machine, an eight-blade rotary spiral cutter makes a trench eight inches wide, true to grade, and leaves the bottom of the trench solid. The blades of the cutter are so arranged that only one blade cuts at a time to a depth of about one inch.



Steered along a Chalk Line, This Machine Cuts an Eight-Inch Trench True to Grade, and Leaves the Bottom Solid

Cmt. Joseph H. Wiley

2800 3/4 Madison Av. Peoria Ill.

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**NEW VACUUM-TUBE AMPLIFIER
AID TO PARTIALLY DEAF**

863 Considerable progress has been made in the development of telephonic hearing aids for the partially deaf, but the limit



Telephonic Hearing Aid Which Employs a Vacuum-Tube Amplifier: Insert Shows the Instrument with the Case Open at the End

had apparently been reached along this line until the new vacuum-tube amplifier was produced. This tube, the result of the efforts of many inventors, consists primarily of a small electric bulb having within it a filament, a spiral wire called a grid, and a metallic plate, all in the order named. An electric current is caused to flow constantly between the filament and the plate in the tube employed in one of the latest hearing instruments. Sound waves striking upon the transmitter of the apparatus, are carried to the grid and greatly amplified by the effect of the current flowing between the filament and the plate, before ultimately reaching the receiver. A rheostat regulates this current in the tube, and correspondingly controls the volume of sound in the receiver, so that the user of this particular instrument is enabled to adjust it so as to conform to his peculiar degree of deafness. The outfit is compactly mounted in a small leather-covered case not unlike the ordinary camera for size, and weighs but 6½ lb., so that it can be carried conveniently on the street, to the church, or theater, as well as proving invaluable in the home. This latest hearing aid is simple of operation and will yield a natural reproduction of voices to persons thus afflicted.

Cmt. & G. Winters
702 District National
MECHANICS Park Way
8684 Washington, D. C.
**TREATMENT FOR CITRUS FRUIT
MAKES ICING UNNECESSARY**

After the grower of citrus fruits has successfully combated adverse weather conditions, blights, and pests, and finally has the ripened fruit ready for market, he still has to face the problem of delivering that fruit to market before it spoils. Under average conditions, this means that the time elapsed from the tree to the consumer should be about 15 days, even when the fruit is precooled and shipped in refrigerator cars. Now, however, this condition may be changed if a new chemical treatment fulfills the claims that are made for it. By this method a chemical emulsion in paraffin is brushed over the fruit as it passes to the packing bins. The chemicals kill all germs and agencies of decay, and then evaporate without leaving taste or odor, while the paraffin seals the fruit air-tight and prevents withering and evaporation. It is claimed that fruit so treated has stood for three months, and when cut, was found to be as firm and juicy as when picked.

866

**SPECIAL RACING AUTO HAS
VERY NARROW BODY**

In the making of automobile-speed records the question of wind resistance is of utmost importance, and special attention is paid to bodies designed to reduce it to a minimum. In one of the modern speed wagons the streamline body is only 20 in. wide and barely provides room for the driver, whose head only is exposed when seated. This car has covered a mile in the remarkable time of 22½ seconds.



This Modern Speed Buggy Has a Streamline Body
Only 20 Inches Wide

International
newspaper corp. Copyrighted material

BEHIND THE MENAGERIE GUARD ROPES

By Frank Braden

*Wright Electric Co.
Chicago*

THERE'S a saying in the circus zoo when a new attendant, disregarding the warnings of old-timers, becomes careless while working about the cages. "Here's a new animal trainer," the veterans will remark, as they watch the fresh helper petting a tiger or a leopard. They know that it is only a matter of a few days until the "cat" will lash out with its claws unsheathed and rip the arm of the newcomer. They also know that nothing will teach this type of attendant the alert carefulness necessary in handling wild beasts but an ugly scratching. They can only hope that the man's hurts will be slight. He must have a lesson. He must realize that all animals are dangerous at all times, even if some are more so than others.

One often hears it contemptuously remarked that such and such a beast in an act is "just a mangy, toothless old lion," but often that mangy, toothless old lion, because of its age, is more danger-

ous than its mates in their prime. The old lion is testy, and no matter what its years, it carries a wallop that will break the back of a horse—a wallop backed by ripping claws. Some of the world's foremost trainers, working with the same beasts in acts year after year, have paid for the slight carelessness that familiarity with and affection for their jungle pets have insidiously brought about. At an unexpected diversion—the overturning of a pedestal, for instance—the animals have leaped upon their mentor, but with the element of complete surprise absent, for no real wild-animal expert is caught completely unaware by a beast's leap. The trainer knows one saving fact—the animal must set itself to spring.

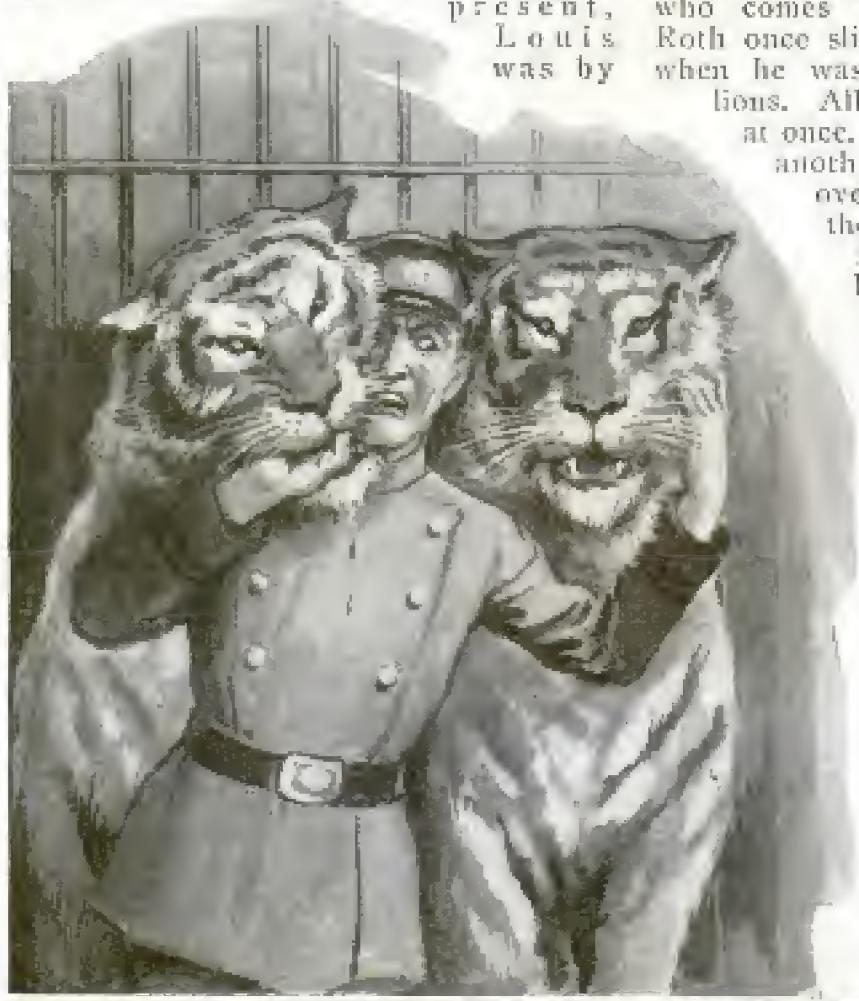
Not long ago Louis Roth, one of America's front-rank trainers, was rehearsing a troupe of eight Royal Bengal tigers in the steel-bound circus arena. The beasts were sulky, snarling, spitting as they resisted the forcing with whip and slender bar carried by the trainer. Time and again Roth had driven the animals to their seats on a semicircle of pedestals, only to have them leap to the

leap to the



"When, to the circus people gazing breathlessly on, it seemed that 'Primer' was in the very act of springing on his trainer, Roth calmly turned his back and swayed his sweeping whiplash at the other cats."

ground as he turned away. The real battle of wills had attracted a large number of the circus folk to the vicinity of the arena. They stood watching anxiously, for they realized that Roth was in trouble, and that he must conquer or lose control of the finest group of Bengal tigers in the land. Of all those present, Louis was by



"He stood between the two largest of the group, with his arms around their necks, their faces pressed against his own. Slowly, irresistibly, the tiger on his right straightened, suddenly to turn and sink his fangs into Roth's right cheek, the long teeth meeting over the trainer's jawbone."

far the least perturbed. He had to win. He knew it, and he forced the issue with the tigers with relentless purpose. Again he drove them to their seats, firing blanks in his revolver, as "Prince," the largest of the group, struck at him blindly, viciously. When, to the circus people gazing breathlessly on, it seemed that "Prince" was in the very act of springing on his trainer, Roth calmly turned his back and swung his snapping whiplash at the other cats. When he finished his work with the animals, Roth was asked how he dared turn his back on "Prince." "He was bluffing!" exclaimed the trainer. "I could tell by his eyes and his muscles that he wasn't set to spring. When a tiger

springs he must get set; he must contract his muscles, measure his distance, switch his tail, as though it were a rudder. The cat does all this in a second, but a good trainer knows, and has time to disconcert the beast with rod, whip, or gun fire."

However, if a number of cats spring together, the trainer is fortunate, indeed, who comes alive through the ordeal. Roth once slipped and fell in the arena when he was "performing" 18 African lions. All the beasts leaped for him at once. Naturally, they struck one another as they met in full flight over his body. Immediately there started the fiercest lion fight in the history of show business—a tremendous battle, with Roth underneath the roaring, ripping, slashing mass of maddened beasts. Attendants, with steel rods, revolvers, and flares, worked like mad, as the trainer, cool even beneath this jungle bedlam, lay perfectly still, waiting a chance to work his way from under the mass of writhing, fighting lions to the door of the great steel cage. Finally, attendants forced the fighting away from Roth, who battled his way out, his clothing ripped into shreds, his body bleeding from 42 cuts.

Another time, Roth was winding up a tiger act with an exhibition of superlative confidence in his control. He stood between the two largest of the group, with his arms

around their necks, their faces pressed against his own. Slowly, irresistibly, the tiger on his right straightened, suddenly to turn and sink his fangs into Roth's right cheek, the long teeth meeting over the trainer's jawbone. One can imagine the agony of it, but Louis Roth held himself absolutely still. With the smell of the blood reaching the tiger on the left, the slightest movement, reasoned the trainer, meant that beast's turning to crush his shoulder or jaw on that side. With infinite care, with almost imperceptible effort, Roth ever so slowly disengaged the fangs of the first tiger from his face. Then he slowly stepped back—and fainted. Alert, loyal helpers, who had

watched their chance from the door of the arena, rushed in firing blanks, and dragged him to safety. When Roth was able to stand, with his wounds roughly bandaged, he stepped into the arena again and raced the two tigers through a routine of tricks. He did this to maintain his control over them, and it was less than a week before he was again doing his cuddling pose with them, his arms affectionately about their necks.

Naturally, trainers that have worked the same group of wild animals year in and year out, grow more or less fond of their charges, and in spite of their knowledge of the beasts' inherent treachery, become too confident of their ready obedience. There is a celebrated woman trainer—Martha Florine—who worked the same group of tigers for 10 years. Each day she rode in parade in the cage with her animals, sitting in a chair with her feet resting on the neck of the largest of them. While the cage was rolling along in the main street of a western city two years ago, the tigers leaped upon her without warning. They knocked her to the floor of the cage, as the crowds along the curbs screamed in horror. The door to the

cage was

locked, and the drivers and parade marshals, who ran to the rescue, could not get in. A man with an elephant hook beat several of the tigers off the unconscious girl, saving her life although she was terribly lacerated, before an ax could be secured in a store and an entrance to the cage effected. She was six months recovering from her wounds, but she is working the same tigers now.

The layman often wonders how the first step in obtaining control of and training wild animals is gone about. Usually the cat animal—lion, tiger, leopard, puma, or jaguar—is "collared," that is, a collar is snapped on its neck, and the beast is held in check by a chain, the end of which is in the hands of attendants outside the steel training arena. The trainer enters the cage in safety and guides the animal to a stool or pedestal, on which he urges it to take position. No animal is beaten into doing the trainer's will, as some suppose. To punish an animal in early teaching is ruinous, and only when it knows what is wanted and refuses, is it touched with a whip. It will be noticed by the close observer of wild-animal acts that no beast is touched with a whiplash while it is on the ground. A surly, combative brute is flicked with the lash or tapped on the nose only when it is on the pedes-



"As the trainer grabbed a rod, the bear sent it spinning and knocked Barry over a bench. . . . The manager, apparently annoyed by Barry's mishap, stood outside yelling: 'Great! Good stuff! Keep it up!' Barry, alternating between justifiable anger at the manager and fright, was astonished to see the bear calmly take position and stand on his head!"

tal. There is a good reason for this. The animal first feels the lash when it is learning to jump on and off the pedestal at the trainer's command. It is then on the chain leash, and if it attempts to spring at its taskmaster, the chain checks it abruptly. Later, when it is unleashed, the

who had had marked success with domestic animals, was prevailed upon by the manager to put the bears through their paces in the center arena. It was in Roseburg, Ore., that Barry, clad in a blue-and-gold suit and patent-leather boots, made his bow from the circle of bears. Everything went splendidly until Barry attempted to make the big brute stand on his head. He gave the animal the cue for the trick, but the brute had become interested in some green grass that had not been trampled down in the arena. He ignored Barry's cue and nibbled unconcernedly at his find. The young trainer smacked him with his whip. Before Barry could move, the bear had knocked



habit prevails. The animal seems to feel that it is still chained when on the pedestal. Thus, trainers invariably punish refusals while the beast is so placed. The danger of a spring is thus minimized. Of course, too much trust cannot be put in this mental trait of the performing cat, as has been shown above in Louis Roth's experiences.

Charles Barry, a leading American trainer, made his début in a wild animal arena with a troupe of performing bears. Because of the fierceness of one of them—a huge cinnamon—several trainers had failed in presenting the act. Barry, who had shown especial aptitude as an aid and

"The first performing hippopotamus became a performer through his first and only escape. The great behemoth broke into a run, turning into the hippodrome track of the main tent, around which 2,000 spectators sat in the stands."

his whip from his hand. As the trainer grabbed a rod, the bear sent it spinning and knocked Barry over a bench. As he fell, Barry grabbed a chair, but before he could raise it, the bear seized it and threw it against the arena bars. Attendants then pushed the bear back with rods and gun fire, while Barry leaped for his whip and the door. The manager, apparently unmoved by Barry's mishap, stood outside yelling: "Great! Good stuff! Keep it up!" Barry, alternating between jus-

tifiable anger at the manager and frightened, was astounded to see the bear calmly take position and stand on his head! The young trainer then showed his mettle. He doffed his cap and made his long-delayed bow. As he did so, the bear righted himself and nipped him on the boot. Barry again tapped the brute—viciously and in wild anger—and the bear took another head stand with entire docility. The act was finished without further untoward incident, and Barry worked it with credit throughout the remainder of the season. However, the manager often expressed regret that Barry did not put in the "hippodroming" that featured his maiden effort.

"It was the biggest hit I ever saw in a wild-animal arena," he would remark.

Many accidents and escapes of wild animals occur in a circus menagerie, of which audiences in the big top adjoining fortunately know nothing. There is the celebrated case of the first performing hippopotamus, which became a performer through his first and only escape. This animal, which is not vicious, crawled from his tank during an afternoon performance,

and was first discovered as he was making his way into the big top. A menagerie man attempted to head him off, but the great behemoth broke into a run, turning into the hippodrome track of the main tent, around which 9,000 spectators sat in the stands enjoying the show. True to circus tradition, there was no confusion among the performers or other employes of the circus, but ringmasters and property men raced to head the hippo and turn him back. Now, be it known, a full-grown hippopotamus, huge and awkward as he is, can outrun a fleet-footed man. This hippo astounded the circus employes by breaking into a sprint and circling the track before the audience had the least idea that anything was wrong. Hardly had the announcer bawled his "Keep your seats, good people!" before the hippopotamus completed the circle, turned again into the menagerie, and crashed headlong into the aviary wagon, with the result that tropical birds were flying all over the place in no time. The hippo stopped short and moved over to the elephant lines, where he placidly helped himself to the pachyderms' hay, without

alarming those huge beasts in the least. He was returned to his cage, the birds, with few losses, housed in makeshift cages, and the big show went on without a "hobble." However, the trainers had been shocked into a big idea. They would train the hippopotamus to circle the hip-



*"In one sweep
of his paw, his
claws caught in
the mesh of the Ger-
man's chain mail. The
trainer leaped back, the
great cat hooked to him."*

podrome track—but under control. This they did the following winter, and only a small whip is now needed to guide the lumbering creature, which, however, is never urged out of a walk. It is a big feature of the show today, but the audience that saw the incident which inspired it, will never forget the speed made by the ponderous, short-legged "blood-sweating behemoth of Holy Writ"—nor will the circus people, for that matter.

The hippopotamus is only dangerous when he charges, and then by reason of his great bulk and through his habit of ramming with his heavy snout. However, his charge is diverted and halted by animal men with whips, who have but to strike him on the head, even tap him, to change his course and slow him up. When the hippo mentioned above circles the track, the attendants keep flicking him with whips on the side of his face toward the audience. This keeps his gaze toward the rings, and should he start to charge, he could easily be halted before any damage, except to circus paraphernalia, perhaps, could result.

There is in the Salt Lake zoo now a

lion by the name of "Brutus," a great, splendid specimen of the black-maned African king of beasts. "Brutus" has a record as a "bad" lion. He has slashed and torn many trainers. Because of his magnificent appearance, every effort was made to subdue him. The best trainers in America "worked" him; and they all bear the scars of "The Order of Brutus," as the zoo men termed the group of wild-animal men who were roughed by the mighty cat. Once a great German trainer announced that he had succeeded in working "Brutus" in winter quarters with a polar bear. He took the manager of the circus and a party of friends to the animal barn to view the act. The lion and the polar bear were turned into the arena together. "Brutus" instantly leaped on the bear, killing it. He then literally ate it up, and the combined efforts of the German trainer and his helpers could not separate him from his kill. Some time later Charles Barry entered the steel training cage with "Brutus." The lion wasted no time, leaping 15 feet at the trainer, who managed to dodge. "Brutus'" head struck the steel bars, and he was dazed. Before he could spring again, Barry knocked him out with a bar. The circus manager then gave orders that "Brutus" was through as a performer, and forbade any trainer entering his cage. The animal was shortly afterward sold to the Salt Lake zoo, where he is securely housed—the finest lion on exhibition anywhere in America.

There is the story of one of Bostock's trainers, who volunteered to subdue a "bad" tiger—a Royal Bengal outlaw. The tiger was a great performer, but he had suddenly turned renegade, killing one trainer and injuring several. The Bostock man, a German of large physique, not only offered to subdue the animal but

promised to present him in the first public performance in Leeds, Eng. Now, the trainer had a plan. He purchased for use in the arena a suit of steel mail, woven to fit him under his uniform. However, his pride prevented his telling anyone with the show about the suit, and as he had encountered little trouble in the training cage with the beast, he saw no reason for any confidences afterward in the matter of his armor. The night of the opening in Leeds, he entered the arena and signaled for the attendants to open the runway gate and let in the tiger. Announcements had been made of the brute's ferocity and almost supernatural strength, and a large audience was present to view the thriller. All went well for a while. Encouraged by his success, the German began to "hippodrome" with his charge; that is, he teased the beast into striking at him as the animal sat on the pedestal. The cat was in a fine performing humor, striking and snarling in a semblance of fury. However, in one sweep of his paw, his claws caught in the mesh of the German's chain suit. The trainer leaped back, the great cat hooked to him. Both lost their heads, the tiger bounding, screaming, spitting as it leaped, rolled, and threshed about, apparently tearing the man into ribbons. Women fainted and men shouted their terror. The cat was unable to extricate his claws, and in the hubbub, the German could not make the helpers understand why they could not drive the tiger from him. At last, a terrific blow on the head stilled the beast, and the claws were extricated from the mesh. The trainer suffered only a few minute scratches, but the audience, which had almost stampeded from the circus building, was convinced it had seen a man eaten alive by a jungle demon.

RADIO GARTER LATEST FAD FOR WIRELESS FANS

Feminine wireless fans will be interested in the introduction of a tiny radio set which is made in the shape of, and is worn as, a garter. Wire is coiled around a piece of cardboard, which is covered with silk, and attached to this are two ordinary eyeglass snap chains, one fastened to the foot and furnishing the ground, while the other is affixed to a coil of wire in the hat and forms the aerial. A small bottle containing the necessary crystal, or rectifier, and a receiver complete the apparatus, which has undergone tests and proved practical.



Above: Radio Garter, Showing the Receiver, Crystal, and Snap Chains.
Left: Illustrating How the Radio Garter is Worn and the Manner of Using It.

Mr. Walter P. Miller, 90 Seattle
1 d.m. Port Intelligencer, Seattle, Wash.

Associated Science Authors,
5 Columbus Circle, New York City
SCIENTIST INVESTIGATING "MOTH RADIOGRAMS"

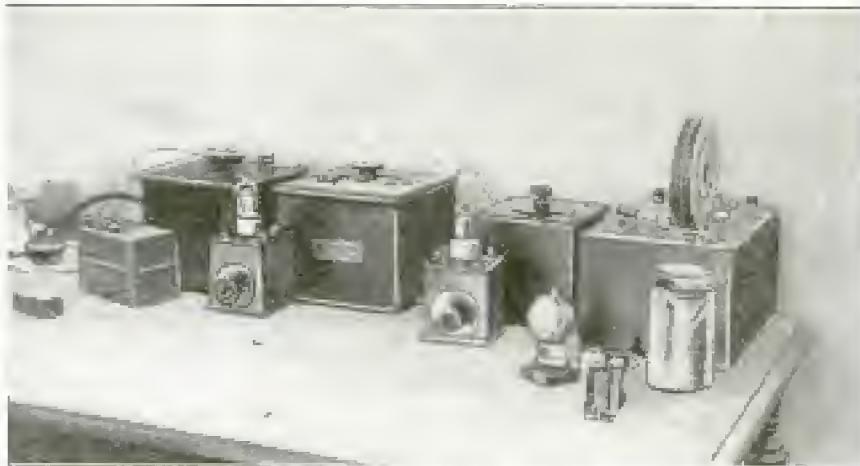
8225

By L. D. LOTTON

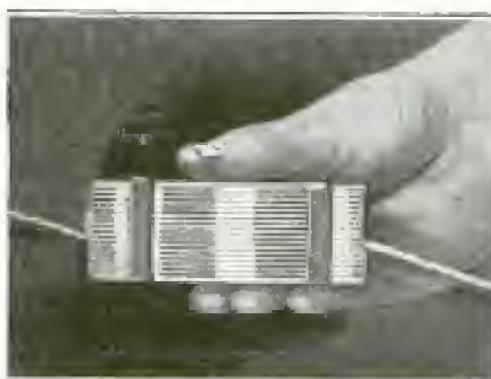
MOTHS and some other insects have a very mysterious way of communicating with each other. The female moth may be caged in a scent and soundproof box, and yet she is able to summon the male moth without apparent trouble. Entomologists have been puzzled by this phenomenon for a long time, and it was recently suggested that a system of radio might be used by the insects. Following this suggestion, a New York scientist, L. C. F. Horle, started to investigate the subject. The ingenious apparatus he employed and the results he has achieved, although not conclusive, are highly interesting.

To the layman, the subject may be more or less confusing, since he cannot possibly understand how a living creature could propagate wireless waves. In the firefly we see a creature that is able to send forth visible rays. Scientists now know that the only difference between visible and invisible waves is a matter of wave length. Wireless waves are long, and light waves are short, but they are both of the same nature. If one insect is able to send forth visible waves, why should

not another be able to send forth invisible waves? In order to send wireless waves



Apparatus Used by Mr. Horle, the New York Scientist, in Investigating the Methods of Communication between Moths, Presumably by Some System Resembling the Propagation of Wireless Waves

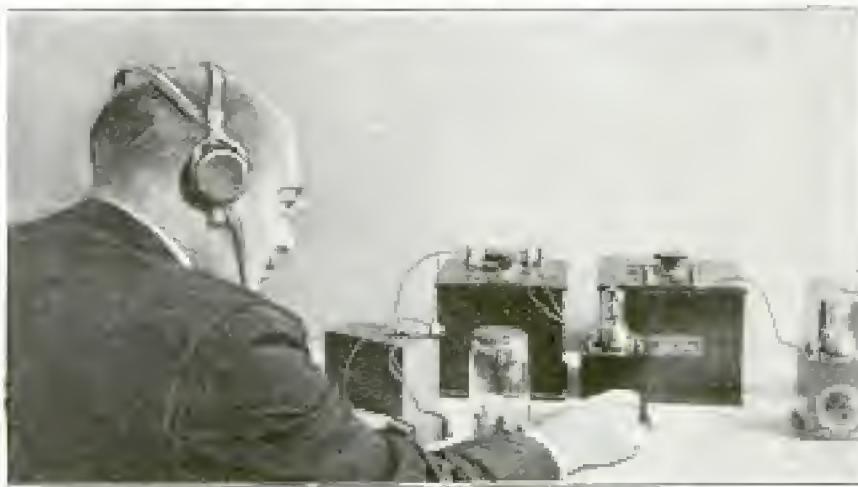


The Sensitive Condenser Microphone Used, Which Is Much More Sensitive Than a Telephone Transmitter

from one point to another, we all know that electric power is necessary. We also know that there are certain creatures, like the electric eel, that are able to produce within their own bodies electric currents of very high potential. This proves that a living creature can generate an electric current. In fact, the human heart produces a weak galvanic current at every beat, and this current has been measured.

In watching moths and studying their action, scientists have noticed the peculiar way in which they use their antennae. When the male is some distance from the female, it will wave its antennae about first in this direction and then in that, as though it were trying to locate the direction in which a message was coming. After some experimentation in this way, the male will take to its wings and fly off to the female.

The apparatus used by Mr. Horle has been especially developed to respond to very short wave lengths. If the creatures do send wireless waves, they must be



"Listening In" for the Moth Messages: The Female Moth is Imprisoned in the Glass Bottle Seen on the Table. So Far No Conclusive Evidence of the Wireless Nature of These Messages has been Found

Investigated by L. C. F. Horle
Copyrighted material
New York

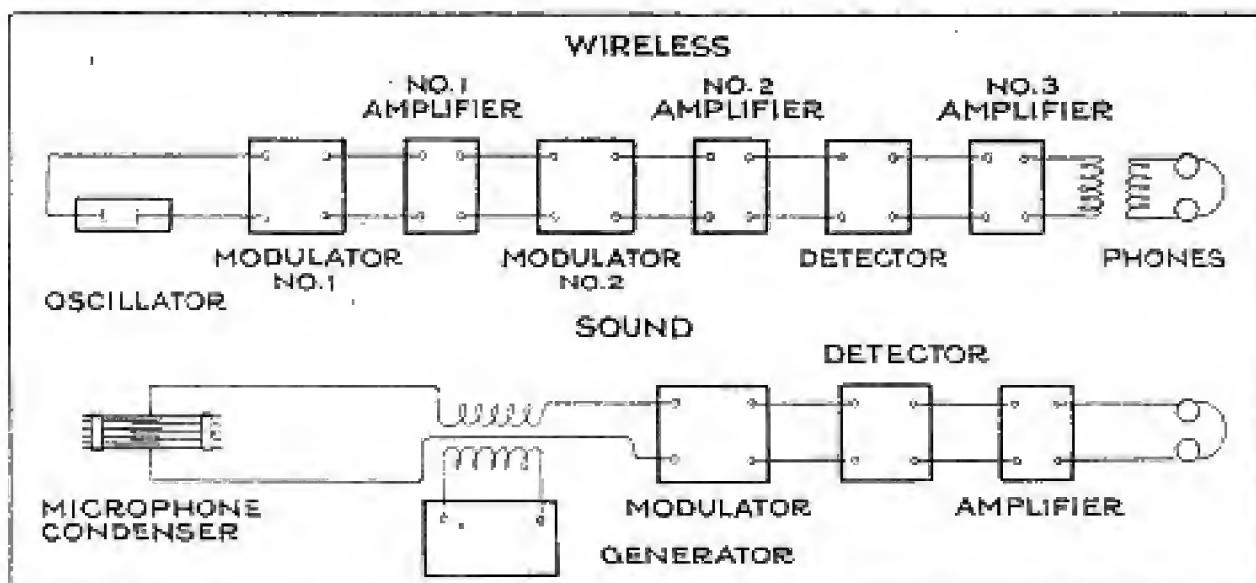
of a length that will put them somewhere between those we call heat and the shortest of those that can be called radio. The wave lengths must be short, since the creatures are small and the oscillator used must be correspondingly small. The strength of the radiations would quite naturally not be very great, and for that reason an ultra-sensitive radio receiver had to be assembled. Before he set out to solve the problem by wireless, he first satisfied himself that sound waves were not used. To do this he invented what he calls a "cell microphone," based on a new principle, and used it with a vacuum-tube amplifying device that would greatly increase the volume of any sound waves detected, even though they were beyond perception by the human ear. Although this apparatus was used under the most favorable conditions, no sound was heard that could be identified as insect communication. His radio device, although of great interest to radio technicians, is too involved to be understood in detail by laymen. Since there is no wave meter that will measure the radiation that could be set up by a moth, owing to its smallness, he assembled a receiver which, by successive modulation processes, converted the small wave lengths into those of the usual magnitude. An oscillator of special design was placed in proximity to the insects. The natural frequency of the oscillator was varied to cover a wide range in wave lengths. The small powers produced from the oscillator were allowed

original wave lengths detected were greatly lengthened and the strength of the radio-frequency current produced by them increased to a point where they would be audible. By knowing the electrical constants of the various circuits employed, the length of the original waves detected by the first receiver could be calculated.

An outfit of the nature described above is extremely difficult to handle, owing to the presence of the numerous vacuum tubes. Unless they are carefully watched and regulated, the tubes will set up various noises which would interfere with the reception of moth messages. Although Mr. Horle has not as yet heard anything that could be identified as a message between insects, he believes this means, not absolute failure, but rather that he has not succeeded in getting his apparatus adjusted to a point where it would be sensitive to small radiations of low intensity. Never before has such an outfit been assembled, and it is but natural that considerable experience will be required before results can be expected.

*8687 — see file. Silvia
ITALIAN POWER PROJECT USES
OLD LAKE BEDS FOR STORAGE*

Many interesting conditions are met in the development of hydroelectric power in southern Italy, but one of the most unusual is in the project on the Sila River in Catanzaro. In this mountainous region there were several basins, believed to have been the beds of ancient lakes



Fully Notated Diagrams of the Apparatus and the Wiring, as Used in Experiments on Sound and Wireless Waves; Lower Diagram Shows the Apparatus Used for Sound Waves, and the Upper One That Used for Wireless Waves

to react upon a radio generator of more nearly usual frequencies. This process was duplicated several times until the

which are now dried up, and these are to be used as storage reservoirs for impounding the water.

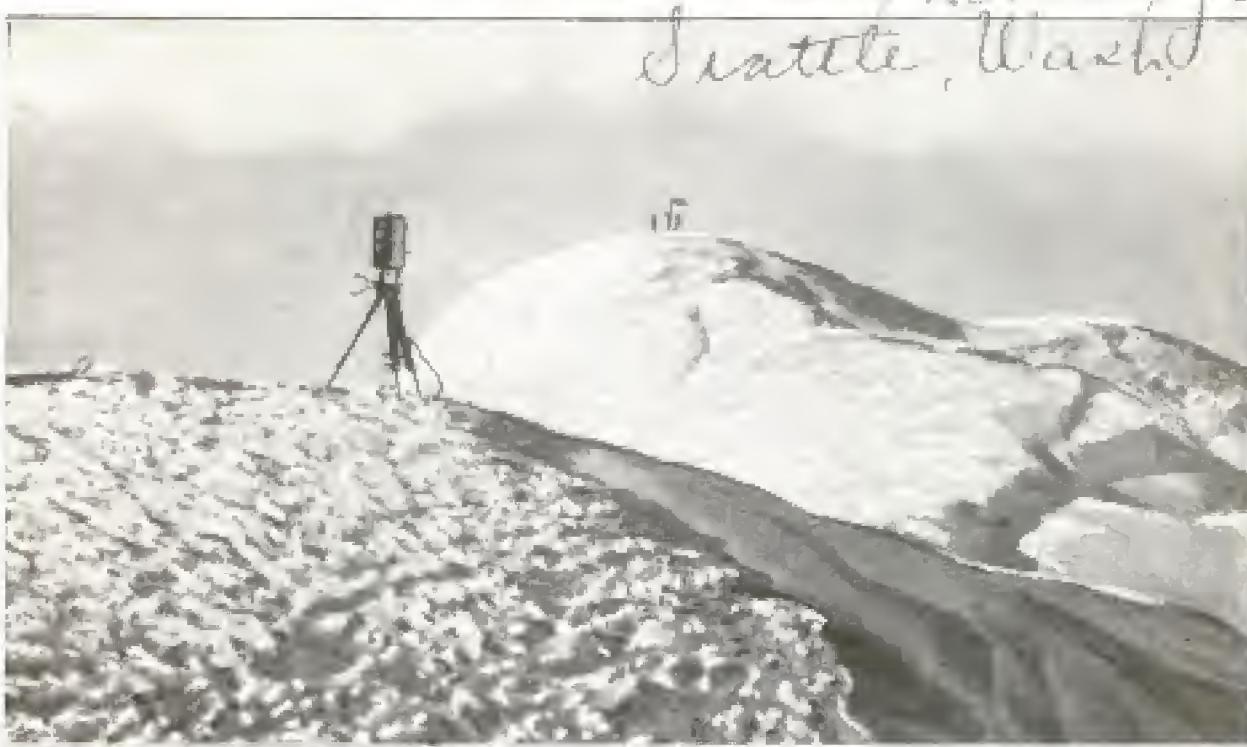
*The Engineer
Copy 2/17/22 material*

8695

CONQUERING MOUNT RAINIER IN MIDWINTER

BY LAWRENCE WILLIAM PEDROSE

Henckley Blvd
Seattle, Wash.



The Summit of Mount Rainier, Conquered for the First Time in Midwinter by a Party of Four Adventurers: The Men are Here Seen Hoisting the American Flag on the Summit, the Climax of a Two Weeks' Struggle with Natural Elements

AFTER a two weeks' contest with storms, four men late in February succeeded in scaling the summit of Mount Rainier, the second highest mountain in the United States. Although in former years many attempts had been made to climb the 14,500-ft. peak in winter, none had been successful.

The climbing party consisted of an American, a Frenchman, and two Swiss. All except the American were experienced alpinists. There was no monetary reward for the climb, and the adventure was undertaken for the sheer love of the thing.

The preliminary work of scaling the

mountain was carried out carefully. Various approaches were reconnoitered, and this precaution took up most of the men's time. The actual scaling of the peak required only five hours, and the return four and one-half hours.

Roped together, 24 ft. apart, with the alpinists in the lead, the men made the dangerous climb, each carrying a pack weighing about 40 lb. At the "Shutes," one of the most hazardous points of the climb, progress was won only by chopping footholds in the ice. At the summit the storm cleared sufficiently for the men to make several remarkable pictures.

Editor P545
COVERED TRUCKS HAUL FIVE AUTO BODIES

Long trucks having canvas covers are used to carry all the closed-car bodies from a Detroit factory to an automobile company in Flint, Mich. Each truck, of which there are 10 now in use, is 55 ft. in length, and has a capacity of five bodies. Motorists on the narrow highway find difficulty in passing the long trucks.



Specially Made Motor Trucks Having Long Canvas Covers, Shown en Route on One of Their Daily Trips from the Factory: Each Truck Contains Five Closed-Car Bodies

*Chet Shaper. Go The Tribune
Flint, Mich.*

8104
714

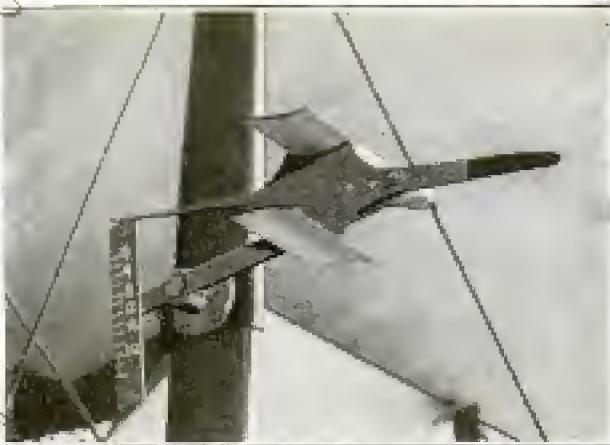
Grenades
Accessories
etc.

POPULAR MECHANICS

Cmt. Raymond A. Fletcher
103 W. 8th St.
Salem, Ohio

ANGLE OF AIRPLANE'S FLIGHT AUTOMATICALLY INDICATED

Difficulty is experienced by the pilot of an airplane in accurately determining whether he is traveling up, down, or par-



Indicator Fastened to Airplane Strut So the Pilot can Tell at a Glance His Angle of Flight.

allel with the earth. The position taken by the plane is termed the angle of attack, meaning the angle at which it is attacking the air, and to determine this an arrangement has been brought out, having a scale which moves with the strut, and a balanced indicator that always maintains a position parallel with the earth. This apparatus is located near the airmen, who can easily tell at a glance whether the craft is traveling on an inclined or level course.

LAWN-MOWER GRASS CARRIER WORKS ON NEW PRINCIPLE

An attachment for carrying the grass cut by a lawn mower, which extends no farther back than the old-fashioned can-



Grass Carrier, Attached to Lawn Mower, Showing the Endless Canvas Belt and the Galvanized-Iron Container

vas basket, has lately been put on the market. The outfit consists of a grass container made of galvanized iron, to which are fastened two wooden rollers and an endless canvas belt. The rollers are driven by a cross belt from the wheel of the mower, and these operate the canvas conveyor, so that the cut grass is constantly carried away from the mower blades and deposited in the large pan.

8689

A NEW INCUBATOR EGG TRAY TURNS ALL EGGS AT ONCE

The present hatching season has marked the introduction of a new type of incubator egg tray which not only adds 25 per cent to the egg-holding capacity of the machine, but also provides a mechanical turning device which turns all the eggs in a few minutes, without removing them from the machine. The eggs are held, pointed end down, in a series of metal cradles which are supported on pivots at both ends. These pivoted ends



In This Incubator Tray the Eggs are Supported in Metal Cradles Which are Pivoted in the Sliding Bars at Their Ends.

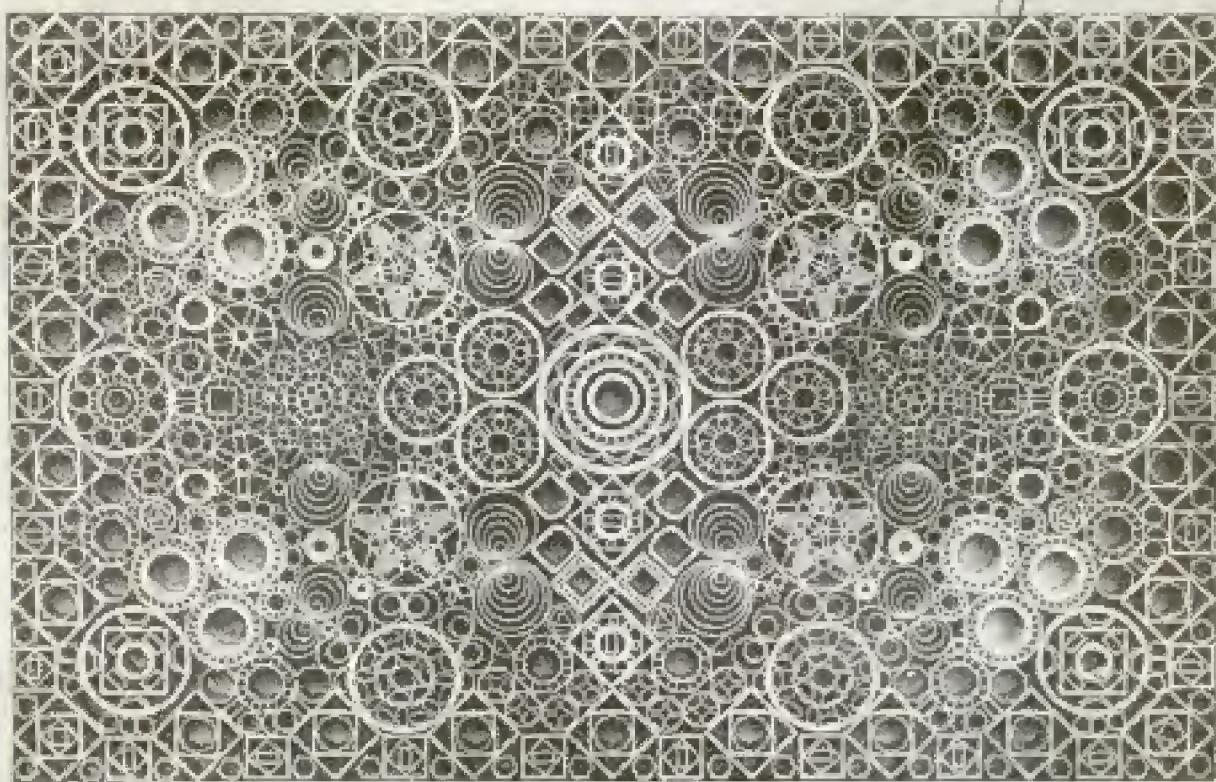
are carried on a shifting lever which can slide along the side of the tray. By moving the lever, all the eggs are turned in a fraction of the time required by the older method of turning by hand.

8688

ATMOSPHERE OF PLANET VENUS CONTAINS NO OXYGEN

According to spectroscopic studies made at the Mount Wilson Observatory of the light received from Venus, no oxygen-absorption lines are found. This indicates that there is no oxygen or water vapor in the outer atmosphere of Venus, and furthermore that the reflected light of the sun must have penetrated to a considerable depth. It therefore appears necessary to attribute the great brightness of Venus to some other cause than that of high reflective power of water-vapor clouds, and this apparent absence of oxygen must be considered in connection with speculations as to the conditions of the planet.

Cmt C. A. Briggs
1521 16th Street, N.W.
Washington, D.C.



Ornamental Table Top, Showing the Various and Intricate Designs Wrought by the Maker of This Most Unusual Piece of Furniture: The Multitude of Varied Shapes and Sizes Are But the Ends of Seamless-Steel Tubing

ORNAMENTAL TABLE TOP MADE FROM STEEL TUBING

Hundreds of pieces of seamless-steel tubing were used recently in the construction of an ornamental table top, producing a neat and original pattern. As this tubing is made in nearly every conceivable shape and size, the number of designs wrought in the top were limited only by the ingenuity of the maker. Ends of tubes were cut off and these, circles, squares, oblongs, rectangles, ovals, hexagons, crescents, etc., were then imbedded in a soft substance and allowed to "set." After being highly polished and

given a coating of lacquer, this table top is said to be one of the most unusual pieces of furniture ever manufactured.

TRACTOR AND AUTOMOBILE MAKE PIONEERING EASY

Automobiles in place of prairie schooners, and gasoline tractors in place of ox teams, mark the difference between modern and ancient pioneering. After settlement upon the land, the difference is between plowing with a yoke of oxen and a single-share plow at the rate of about an acre a day, and plowing with tractor-hauled gangplows at the rate of



Modern Pioneer Taking a 140-Mile Jaunt on a Tractor Which is Hauling a Load of Four Tons, Including the Indispensable Automobile: Note the Headlight on the Tractor for Night Traveling

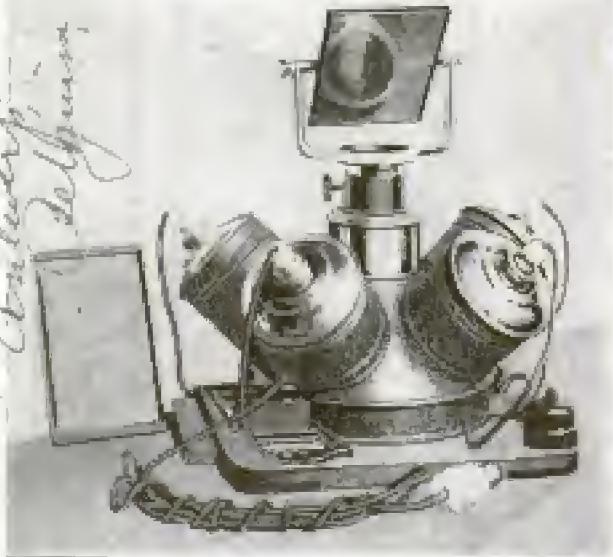
Curt. E. L. Lurgin, 130 Lexington Ave
Rannie Vis
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M.S.A. Journal
(Sydney)
Jan 15
F. G. C.
POLISHED METALS ANNEALED
WITHOUT TARNISHING

tens of acres a day, according to the size of the tractor. In a recent instance of modern pioneering, the traveling outfit consisted of a tractor that hauled an ordinary lumber wagon in which were loaded the pioneer's farming and camping outfits, and a gasoline tank. Hitched to this was the inevitable automobile with a truck attachment in the rear, handy for personal baggage. The whole load pulled by the tractor was four tons.

PROJECT VIEWS OF OBJECTS WITH REFLECTING DEVICE

8609 A new form of projection apparatus has been developed abroad which can be



8609 When Placed over Objects, Printed Pages, or Photographs, This Apparatus will Project Views of Them Which can be Thrown onto a Screen

placed directly over the objects, printed pages, or photographs to be shown. Four high-power lights illuminate the object and the view is projected by the lens into the mirror above, which reflects it on the screen.

CHURCH BELLS DEMONSTRATED OVER THE TELEPHONE

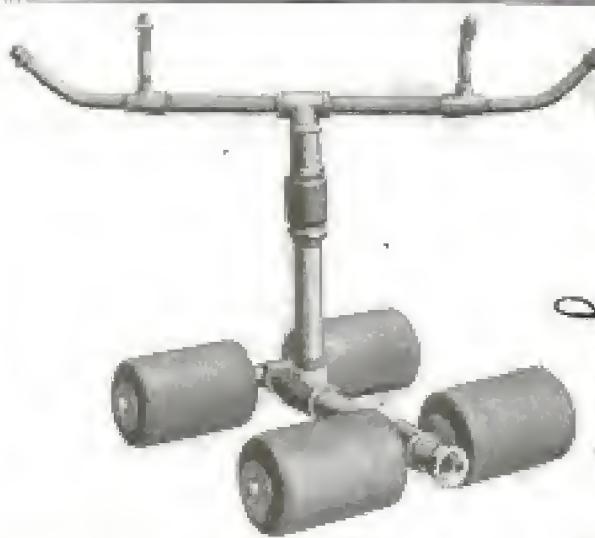
8610 An eastern church committee was given the task of selecting a bell, and the chairman called a bell factory by long-distance telephone to arrange for a visit to the plant. While conversing, the tolling of different bells being tested was transmitted so clearly over the wire, that the chairman decided that the selection could be made without going to the factory. Accordingly the entire committee was assembled and each "listened in" on the demonstration, until one of the bells was unanimously chosen.

POLISHED METALS ANNEALED WITHOUT TARNISHING

By covering with a very thin film of boric oxide any polished article that has to be annealed, there will be none of the tarnish which results under ordinary treatment. The coating of boric oxide will resist temperatures up to 1,202° F., which is high enough to protect polished steel from any coloration when it is tempered. The coating is fireproof, does not evaporate, and dissolves any oxidized matter on the surface of the heated metal. It can be applied either as a powder or as a liquid. After annealing, the coating peels off, or may be dissolved in warm water. The process has been patented.

8612 GOLF-COURSE SPRINKLER HAS RUBBER ROLLERS

Marring the turf of a golf course is always prevented if possible, and one of the latest of these preventives is a rotary sprinkler having rubber rollers, which allow it to be moved freely on the greens and fairways without injuring the soft sod. The sprinkler is 19 in. high, with an area spread of 28 in., weighs but 14 lb., has connections for either $\frac{3}{4}$ or



Golf-Course Sprinkler, Showing the Four Rubber Rollers, Hose Connection, and Spread of Sprinkling Arms

$1\frac{1}{2}$ -in. hose, and has a capacity of 15 gal. per minute over a 70 to 90-ft. area.

8611 Portable altars will be installed in all the passenger steamers of the Cunard Line, according to late reports. During the busy tourist season, one large public room in each section will be set aside for Protestant services and Catholic masses,

8482 Cont. H. E. Thomas, 911 Glencoe Av.
Portland, Oregon
POPULAR MECHANICS
Tacoma Ledger 2/12

517



MOTOR TRUCK MOVING A 250-TON OFFICE BUILDING, IN PORTLAND, OREGON: The Truck was Blocked, and a Winch, Driven by Its Engine and Mounted Just behind the Seat of the Machine, was Used to Move the Heavy Structure a Little at a Time.

TWO-STORY OFFICE BUILDING MOVED BY MOTOR TRUCK 8481

Moving a two-story office building without interrupting the duties of the employes therein, was accomplished recently in Portland, Ore., with the aid of a motor truck. The building is 40 by 80 ft. in size, weighs approximately 250 tons, and was to be relocated at a distance of 600 ft., in addition to being turned completely around. The workmen used a winch mounted on the truck, and driven by its engine, and thus slowly but surely moved the structure to its new location.

TO INVESTIGATE PROPERTIES OF ALUMINUM ALLOYS

Extensive investigations of the properties of light aluminum-alloy castings are being undertaken by the Bureau of Mines, and, when completed, will give exhaustive information on this important subject. The study will not be confined to the physical properties alone, but will deal with the subject of sand castings, die castings, and permanent mold castings. There will also be a discussion of the principal aluminum-alloy systems, such as aluminum copper, aluminum iron, aluminum manganese, aluminum zinc, and others.

*U.S. Bureau of Mines
Washington, D. C.*

SHARK-PROOF NET PROTECTS LONG-DISTANCE SWIMMER

How to swim with safety in shark-infested ocean waters was demonstrated recently by a negro in Queensland, Australia, who insisted on swimming from Magnetic Island to Townsville, a distance of five miles, in spite of the sharks, and also of police interdiction. Indeed, it was only on account of the latter that he even deigned to take the precaution of surrounding himself with a floating wooden frame from which was suspended a shark-proof net, 6 ft. deep. The frame and net were towed by a launch, and the negro accomplished hisfeat without experiencing any interference.



Australian Negro Swimming in Shark-Infested Waters: Suspended from the Floating Frame Is a Net, Six Feet Deep, Which was Towed Along as He Swam.

*Cont. G. W. Clark, c/o Mrs. Turner,
Bulindoo St., North Ward, Townsville,
Queensland, Australia.*

Carl C. H. Weldow,
Delavan, Wis.

La Nature 2/1/20

718

POPULAR MECHANICS

PRINTING-PRESS ATTACHMENT FOR DISTRIBUTING THE INK

For the production of high-class printing, such as half-tone and color-process

ELECTROMAGNETIC RECOVERY OF COAL FROM CINDERS

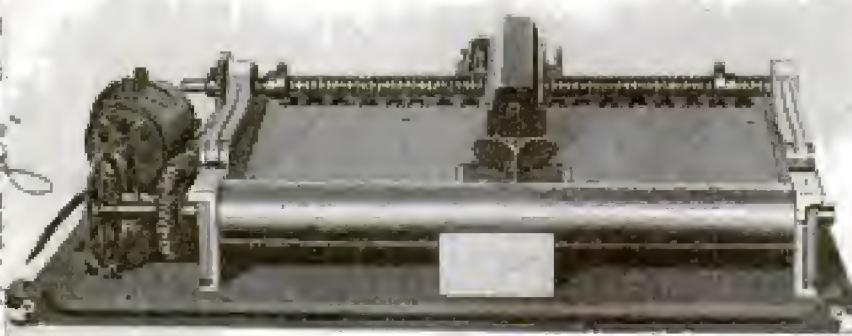
In all furnaces to some extent—in some more and in others less—a certain amount

of coal falls into the ashes that is only partly consumed by the fire. Considering the present high cost of coal, especially in Europe, it is not surprising that much interest has been attracted there to the efforts of a German inventor to separate this partly consumed coal from that which is entirely consumed. The method employed is based upon the fact that all coal contains a certain amount of iron pyrites, and that during combustion the iron in this compound becomes converted into an oxide and remains in the cinders. Iron pyrites, such as contained in the unconsumed coal, is not sensitive to magnetic attraction, but the iron oxide in the consumed coal is to a certain extent.

Therefore, if sufficiently powerful magnetic attraction be employed to hold the completely consumed cinders, those only partly consumed will be allowed to escape and can be recovered by a simple separation process.



Rear View of the Printing-Press Ink Equalizer, as It Appears When Motor-Driven and with the Inking Knife in Operating Position



Front View of the Ink Equalizer: The Inking Knife is Automatically Reciprocated by the Threaded Spindle in Connection with It

work, and of any ordinary printing with minimum spoilage, a machine has been designed that, when attached to the press, keeps the ink smooth, soft, and equally distributed. Placed in the fountain it has an adjustable blade that can be raised or lowered to turn any amount of ink desired. When in operation it scrapes the ink loose from the bottom of the fountain, and also plows it against the fountain roller, insuring even distribution on the duct roller. The blade is reciprocated by means of a drive screw which has an adjustment for any-size form. The blade is on a hinged frame which can be raised and moved out of the way when putting ink in the fountain. The attachment can be run by an individual motor or by gears from the press. It eliminates pressroom delay caused by stiff ink.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the Bureau.

POWERFUL MAGNETIC ATTRACTION

LETTER IS PLAINLY VISIBLE IN GLASS-BODY MAIL BOX

A very attractive mail box is being made in which the body is of glass. It can be fastened to the wall or other convenient point, and is so designed that the holding screws cannot be removed when the lid is locked. One advantage of this box is that the contents are always plainly visible. A spring clip is provided for holding papers or envelopes too large for the box.

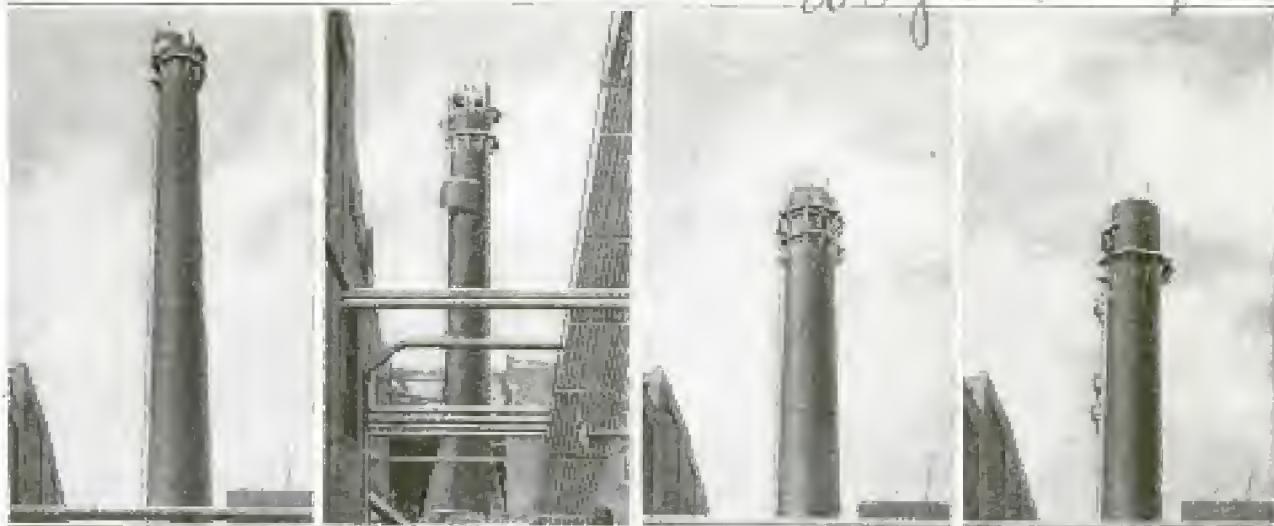


Ineath Islands Co.
Nartford City, Conn.
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Cmt. Ralph C. Smith
24 Forrest St.

POPULAR MECHANICS

Weyandotte, Mich. 619



From Left to Right: Beginning at Top to Wreck Old Worn-Out Steel Stack with Movable Platform around It; Wrecking in Progress, Showing One Plate being Lowered outside the Stack; Still Further Progress with Two Platforms in Place; Three Steeplejacks Climbing the Ladder to Platform on Stack

UNUSUAL MEANS OF WRECKING WORN-OUT STEEL STACK

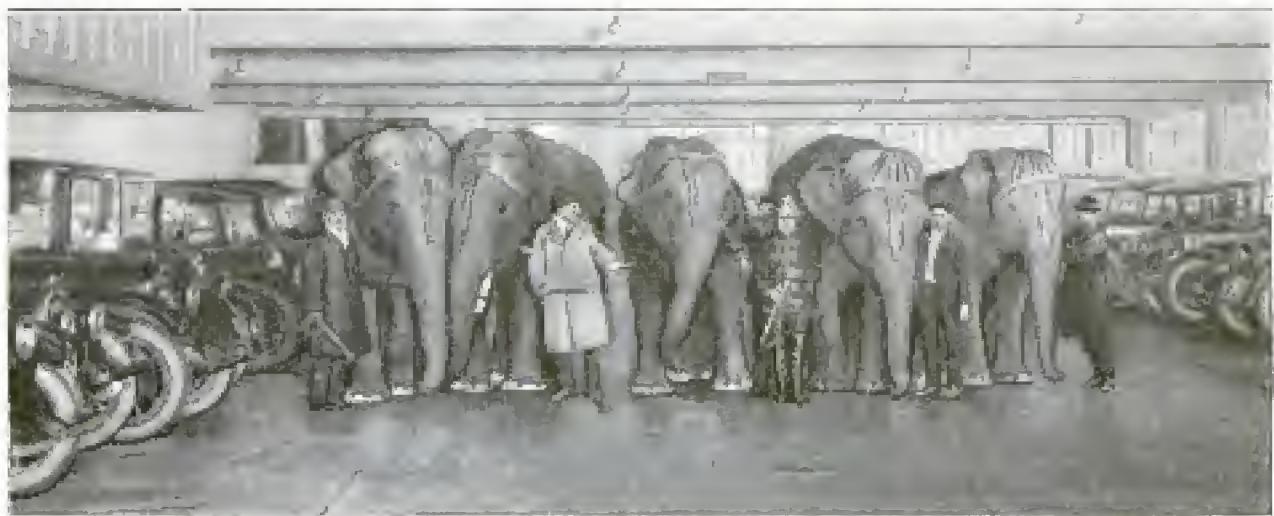
An unusual exploit, done in an unusual manner, was the wreckage recently of a steel stack at an alkali plant in Ford City, Mich. The stack was 180 ft. high, 10 ft. in diameter, and self-supporting. It had been in use for 27 years, and the action of the heat and chemicals in the smoke had pulverized its brick lining, and had eaten away the steel so that the plates buckled and the rivets could be pulled out with the fingers. In wrecking the stack, a scaffold was erected inside it in order to carry a 6 by 6-in. pole. Two 20-in. platforms were placed around the outside of the stack, supported on brackets that were clamped to the stack by a cable tightened with a turnbuckle, thus making them movable. The brick lining on one tier of plates, which were 6 ft. 8 in. wide, was first lowered down the inside

of the stack, and then each plate in that tier was taken off and lowered down the outside of the stack by means of the pole and a winch. The job was completed in six days by three steeplejacks above, and two laborers on the ground, without the slightest mishap.

ELEPHANTS ACT AS EXPERTS FOR TESTING FLOORS

84 39

Great confidence was recently placed in the popular tradition that an elephant will refuse to walk upon an unsafe structure. Wishing to determine the strength of his garage floor, a Canton, Ohio, man employed the services of five circus elephants to act as test load. They were led upon the floor and grouped as closely as possible, making a live load of more than 15 tons on the center of the floor—probably the first of this unusual description to be used for such a purpose.



Five Elephants from a Visiting Circus were Employed as "Safety Engineers" in Testing This Garage Floor. Grouped as Closely as Possible, They Represent a Combined Load of More than 15 Tons

Cmt. W. M. Nicholson, 1407 Logan Av. N.W.
Canton, Ohio.

ent. W. K. Crosson.

85/9 4429 Townsend Aug
220 *Editorial Note*

POPULAR MECHANICS

WINDSHIELDS ON UPPER DECK FOR PASSENGERS' COMFORT

Accessories
Many motor-bus patrons prefer to ride on the upper deck of the bus but are deterred during the winter months by the



The Big Windshield across the Front and the Individual Shields for Each Seat Make the Upper Deck Comfortable during the Winter Months.

chilly winds. This has led a Detroit bus company to install windshields on the upper deck, and they have proved very successful. One big windshield extends across the front of the bus, and each seat is also equipped with an individual shield.

8600

INERT GAS USED IN CANNING VARIOUS FOOD PRODUCTS

Ninety per cent of the present commercial canned food would be improved, it is claimed, by the complete elimination of the oxygen in the container. This has been known for some time, and various expedients have been adopted, such as venting the cans after heating and sealing while hot, but none has succeeded in removing more than from 50 to 80 per

cent of the oxygen. For some nine years now a much more effective method has been under development, namely the substitution of inert gases for the oxygen. By the use of such a gas, canned coconut has been produced without any loss of flavor whatever. The inert gas used has been carbon dioxide, and an ingenious mechanical method has been developed by which the oxygen is removed by suction from large numbers of cans rapidly, and the vacuum is automatically filled with carbon dioxide. Packers are now considering the possibility of applying the process to many other products.

DEVELOP MANGANESE MINES 8045 IN ARGENTINA DESERT

The United States imports more than 500,000 tons of manganese ore a year. It is principally used by steel mills in the manufacture of the very hard manganese steels, and by glass factories in the manufacture of flint glass. It is also used in making electric dry batteries. Brazil has always been the great source of manganese, while India and Cuba are also important producers. Recently manganese mines have been discovered in Argentina, and an Anglo-Argentine company is developing the industry in that country. The Argentine manganese occurs in a single vein running for about 50 miles through the Santiago desert in the center of the republic. The greatest width of the seam is about 8 ft. The ore is about 75-per-cent pure manganese dioxide, and is claimed to be superior to the Brazilian. The mining is done by native Indians, who are paid an average of one peso per day, or the equivalent of about 33 cents. The ore is brought to the railway, a distance of 90 miles, in two-wheeled carts, carrying a ton and a half of manganese.



Left: The Manganese Vein Runs for Approximately 50 Miles across the Desert. Right: After the Ore is Mined, It is Sorted, Graded, and Sacked by Indian Women and Boys, and is Then Hauled a Distance of 90 Miles, to the Railroad.



ent. Mrs. George S. Brady, of American Embassy
Chacras 708, Buenos Aires, Argentina
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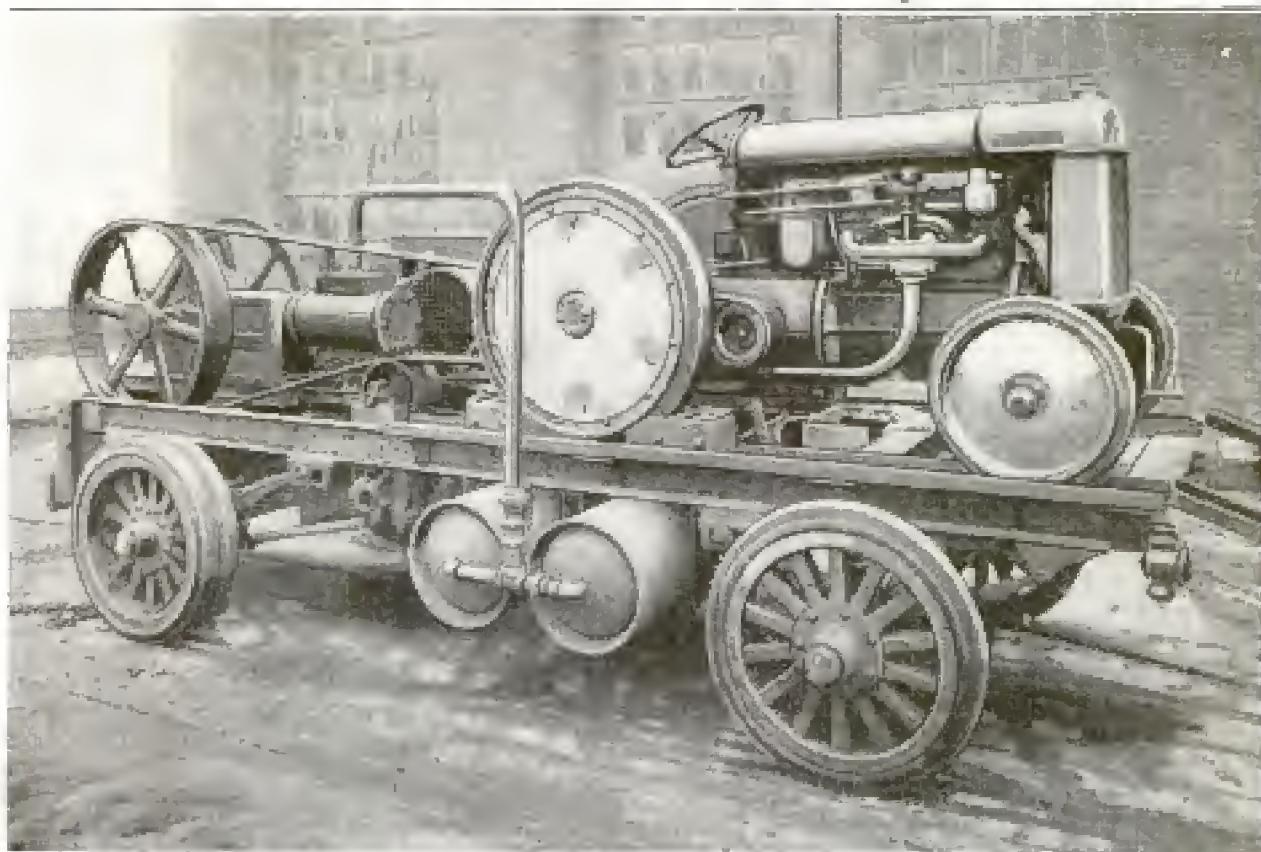


Illustration by J. H. Dillenbeck

Motor-Truck Chassis with Air Compressor Mounted on the Left End: The Tractor on the Right End of Chassis is Used to Haul the Apparatus from the Garage to the Job, Where It Drives the Air Compressor during the Day, and to Pull the Truck Back to the Garage at Night

DOUBLE SERVICE OBTAINED FROM SMALL TRACTOR

"Killing two birds with one stone" is figuratively done with a small tractor which hauls a concrete-drilling outfit to the job, and then runs up on the chassis of the specially built truck, where it is belted to an air compressor. All day the tractor faithfully chugs away in driving the compressor, and at night it runs down from the chassis and obligingly pulls the apparatus back to the garage.

\$596

MAIL CARRIED BY DOG TEAM IN SOUTHERN CALIFORNIA

On a power-tunnel project in the high mountains of southern California, it was decided to keep the construction work going during the winter from both ends of the tunnel. The road connecting the two ends of the tunnel leads through a pass at an elevation of more than 9,000 ft., and is of course blocked with snow during the winter. In order that mail might be delivered regularly at the farther camp, a team of seven Alaskan dogs is employed, and under favorable conditions can take a load of 500 to 600 lb. over the route.

Engineering News-Record
12/20/32

ESKIMOS' WHALING BOATS

ARE AMERICAN-BUILT

The boats used by the Eskimos of Alaska, as described and elaborately illustrated in "Whale Hunting on the Top of the World," in the February issue, are all American-built. Many of them are built at New Bedford, Mass., and are shipped from there, by way of the Panama Canal, to the Arctic regions. The



Whaling Boats for the Eskimos of Alaska on Their Way to the Steamer Which will Take Them, via the Panama Canal, to the Arctic Regions

boats are not needed in large numbers, and this year's shipment from New Bedford thus far consists of only four boats.

Cud. C. H. Dillenbeck
 557 E. French Ave.
 New Bedford, Mass.

Cont. S. A. Brouwer, Pine Wold Park,
Westhampton, N.Y.



"The Castle" Built by the Artist with the Help of One Man: The Structure Is of Brick and Concrete, and was Built in His Spare Time during the Course of Eight Years. There Are Many Examples of Concrete Sculpture in the Building

DECORATIVE EFFECTS IN MOLDED CONCRETE

When one speaks of concrete, it conjures up visions of retaining walls, severely plain buildings, and massive bridges, but T. A. Brouwer, of Westhampton, N. Y., has shown that this material is admirably

adapted for artistic work. On his estate, called "Pine-Wold Park," are many examples of his art, in the form of statues, fountains, and the like. In some instances, it seems almost impossible that such delicate figures and designs could have been made of concrete, yet such is the case, and the artist contends that it is a very easy matter to make them.

In making a statue, for example, he first makes a frame of light iron pipe, or heavy wire, which conforms to the general lines of the figure and is really the skeleton on which it is molded. Over this frame, a wire-mesh form is molded by hand along the general lines of the figure. This mesh form is made of $\frac{1}{4}$ -in. galvanized-wire netting and serves as the foundation for the concrete. A mixture of one part cement to two parts sand is used, and is placed and molded by hand. After the general outlines of the figure are formed, the excess material is cut away and the finishing coat of cement is applied with a brush. When this has set, the figure is finished by chipping and working over with a fine chisel.

This method is not limited to statuary but can be applied to decorative effects for buildings, cornices, fireplaces, and also for



"The Soul of a Rose:" The Figure of a Butterfly-Woman Bending over a Wild Rose, Molded of Concrete over a Wire-Mesh Frame, Shows the Delicate Effects Produced by This Method



Left: A Fountain of Molded Concrete, in Which the Large Shell was Shaped Out of a Single Block as the Material was Setting, the Figure being Built Up on a Frame of Iron Pipe and Wire Mesh. **Right:** Decorative Pier, Seven Feet High, Cut from a Solid Block. The Bird on Top of the Pier is Molded over a Wire-Mesh Frame

many other purposes. The work can be done very rapidly and the decorative effects are limited only by the skill of the sculptor. The artist has been able to produce various color effects in his work by the proper blending of the material used. Some of his groups of statuary are given a finish similar in appearance to antique bronze, which is very effective against the forest setting in which they appear. Contrasting effects are produced by placing white relief figures or designs against a background of gray or darker colors.

BEEHIVE GATE PASSES ONE BEE AT A TIME

An interesting problem has recently been brought to the attention of the Bureau of Standards by the Bureau of Entomology. In studying the habits of bees they desired to learn the number of bees leaving the hive during the day, so a gate was devised which would permit only one bee to pass at a time, and an arrangement was made whereby the number of bees was counted automatically. The little counting device which is used for registering the number of telephone messages on a given instrument was employed as a recording device. A series of these registers were installed in such a way that the number of bees passing the gate was recorded. As only al-

ternating current was available where the counting was done, it was found necessary to find means of operating the counters on current from rectifiers. Current from batteries could not be used on account of the great number of times the gate would operate during the day, as many as 300,000 exits per day being expected.



Another View of the Fairy Figure Whose Wings Are of Concrete, Modeled and Shaped by Hand, While It Is Still Plastic, over a Frame Made of Stiff Wire

8634
724

POPULAR MECHANICS

ROLLER CURTAIN IS MOUNTED
ON BOOTBLACK STAND

Feminine customers showed so much embarrassment while having their shoes shined, that a sympathetic New York



Bootblack Stand with Roller Curtains, Enabling Women Customers to Protect Themselves against Annoyance from Passers-By

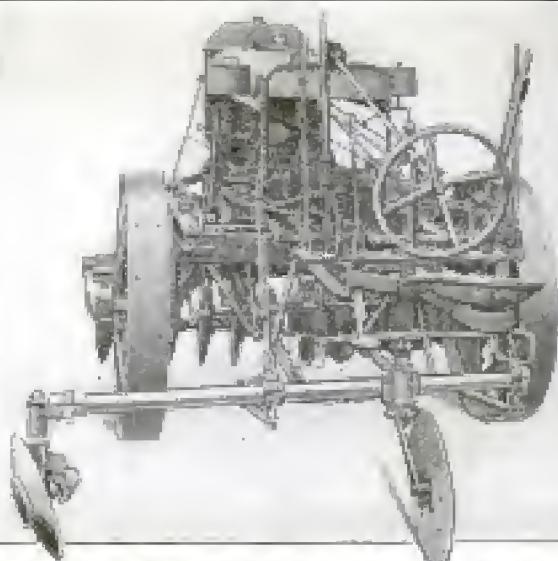
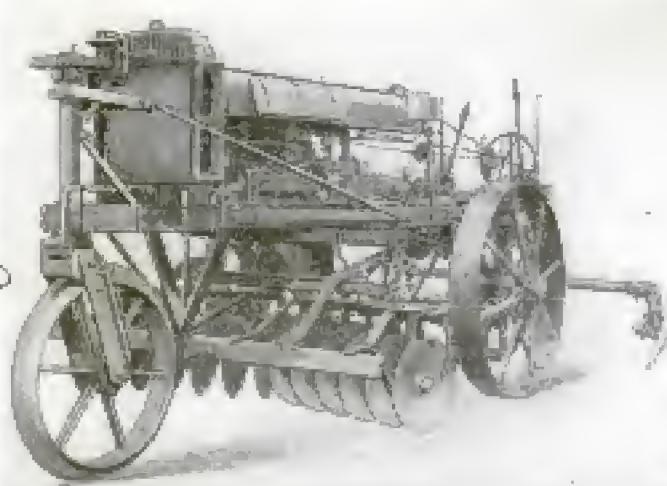
bootblack mounted a roller curtain on his stand. Now the wearer of the most abbreviated skirt can pull down the curtain to suit herself, and sit unconcernedly in the elevated chair for a "shine" without being annoyed by the interested glances of the rude passers-by.

8634
SUBSTITUTES FOR PLATINUM
PROVE SATISFACTORY

In a search for a substitute for expensive platinum, various alloys have been tried and some have been found satisfactory for different purposes, although no general substitute has been evolved. One combination, known as "palau," resists the activity of most of the reagents, while another, called "rhotanium," is claimed to make a good substitute for electrical-heating units.

MOTOR VINEYARD CULTIVATOR
OPERATED BY ONE MAN

8634
As an economizer of time and labor a motor-driven implement has been designed to furnish in one machine a complete equipment for vineyard cultivation. With only one operator, and one operation, it will both harrow the rows and hoe the vines. It can also be used as a tractor for hauling a three-base vineyard plow, and as in the case of ordinary tractors, it can be used as a stationary power plant. Its motor is of the tractor type, with a three-speed selective gear transmission, all mounted on a three-wheeled chassis, and between the front steering wheel, controlled from the driver's seat, and the traction wheels in the rear is a regular disk-harrow equipment, with 12 disks, which is controlled by the operator's feet. Behind the traction wheels is the attachment that hoes the vines. When turning, either of the traction wheels can be left stationary while the other is revolved, causing the cultivator to turn in either direction within a 10-ft. radius.



Motor-Driven Vineyard Cultivator, with Self-Adjusting Disk Harrow in Front of Traction Wheels, and Vine Hoe behind Them: The Driver Sits at the Rear, and with the Large Steering Wheel Operates the Front Wheel

Joseph H. Wiley, 2800 1/2 N. Madison Ave.
Copyrighted material
Peoria, Ill.



Above: The Raft and Derrick are Towed from Place to Place by a Tug. Right and Left: Two Views of the "High Lead" Used in Removing the Felled Timber from the Steep Bluffs.

THERMOMETER HOLDER ON BED IS HANDY AND SANITARY

8664
Clamping to the bed a small metal holder containing a glass tube, in which

can be inserted the ordinary thermometer, or fever register, of the sick room, is the latest method used in hospitals. Following this procedure, there is slight chance of the thermometer being interchanged with that of another patient,

or mislaid, thus furnishing a sanitary innovation for the care of the sick.

6476

USE HUGE FLOATING DERRICK IN LOGGING OPERATIONS

Efficient logging of many wooded islands and steep headlands of the British Columbia coast was a problem that long baffled Canadian timbermen. The solution has been found in a floating logging camp, consisting of a pile driver, donkey engine, and derrick, all assembled on one raft which is towed from job to job. The raft is built of huge logs, and is 106 ft. wide and 130 ft. long. The two upright timbers form what is known as a "high lead." Cableways from the high lead into the forest areas provide means of rapid transportation of logs to sea level. The

sticks forming the uprights are each 126 ft. long, 6 ft. in diameter at the base, and 34 in. at the top. A seagoing tug tows the raft to islands and rugged coasts where customary methods are not applicable.

The raft is placed on the beach and anchored with piling, and guy wires are fastened to the shore. The ordinary high-lead system of logging is then used to swing the logs to the shore, where they are piled like so much cordwood, half submerged in water, to form rafts.

8447

ELECTRIC WINDOW RADIATOR IS FROST PREVENTER

Formation of frost on windows can be prevented by the use of an electric radiator, which was designed expressly for this purpose. The appliance consists of a small metal frame extending below the window, mounted on metal supports and containing a heating element. Connected to any light socket, the apparatus gives sufficient heat through its perforated sides to keep the glass clear on the coldest days.



Electric Window Radiator Placed in Position to Prevent Frost from Forming on the Plate Glass.

*Coul. Mel Wharton
690 E. Alder Portland Ore.
Coul. X. H. Hamilton
1507 E. 6th St. Chicago*

New York City

8666 Grand Ave.

*Overland Electric Co.
4236 Ogden Ave. Chicago*

2/18/22

726

POPULAR MECHANICS

\$5 53

8111

HANDY INHALATION OUTFIT
OF NEW DESIGN

Inhalation outfits are numerous, but one of new design consists of a specially constructed mask of rubber, to



Inhalation Bottles of Liquids to Which is Attached the Rubber Tube Leading to the Special Rubber Mask That is Placed over the Nose

which is attached a tube of the same material. The tube is fastened to bottles containing liquids, which, when inhaled, are transformed into dry gases, and are said to afford relief to the organs of the respiratory tract, when afflicted.

Under the terms of the Leasing Act, royalties of more than \$2,000,000 were paid during the year 1921 for oil and gas produced on government-owned land in the West.

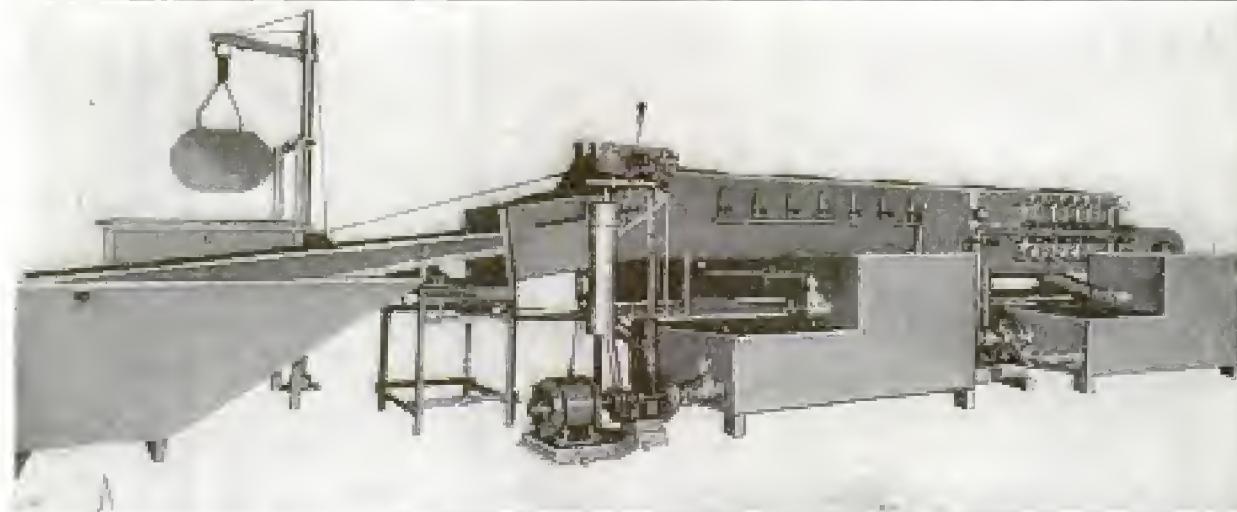
PERSONAL HEATING POSSIBLE
IS THEORY OF ENGLISHMAN

Giving as an illustration the pleasing effect produced throughout the body by holding anything warm in the hands, or by immersing the hands in warm water. J. W. Beauchamp, director of the British Electrical Development Association, recently suggested the possibilities of personal heating. According to his theory, in the future, instead of seeking better means of heating the atmosphere within buildings, an effort will be made to heat the bodies of the occupants of these places by individual electric devices, thus leaving the air as fresh as on the outside. The lecturer also thought that science would soon discover a method whereby merely the presence of some small heating medium about the person would provide sufficient heat to make anyone comfortable.

8496

NEW FRUIT-PEELING MACHINE
USES CAUSTIC-SODA VAPOR

Fruit canners now have available a new peeling machine which is said to reduce the amount of lye used by half, greatly improve the color and flavor of the product, and effect a saving of approximately 50 cents per ton. With the improved apparatus, the fruit is placed on a conveyor belt, preheated, and then run for about 30 seconds through the vapor of caustic soda, which loosens the peel. Then, without being touched by hands, the fruit passes along between sprays of water which wash the peel off, and which can be carefully regulated according to the condition of the fruit.



Fruit-Peeling Machine Erected and Ready for Operation in a Canning Plant: The Fruit is Placed on a Conveyor Belt at the Left End, Passes through the Machine without being Touched by Hands, and Emerges at the Right End Thoroughly Peeled and in Readiness for Canning.

Glunkley Co., 120 N. Oakland, Calif.

8512 Col. J. A. Schmidt
3567 St Charles Place,
POPULAR MECHANICS 127
Dodge Park, Cincinnati, Ohio.



TANKS USED TO DESTROY STILLS CAPTURED IN RAIDS

NEW uses are constantly being found for tanks, but one of the most unusual was the reduction of some "moonshine" stills to a condition of junk. During a recent clean-up campaign in Newport, Ky., more than 30 of these illicit stills were taken and were then destroyed by driving two tanks over them. The wreckage was later sold as junk.

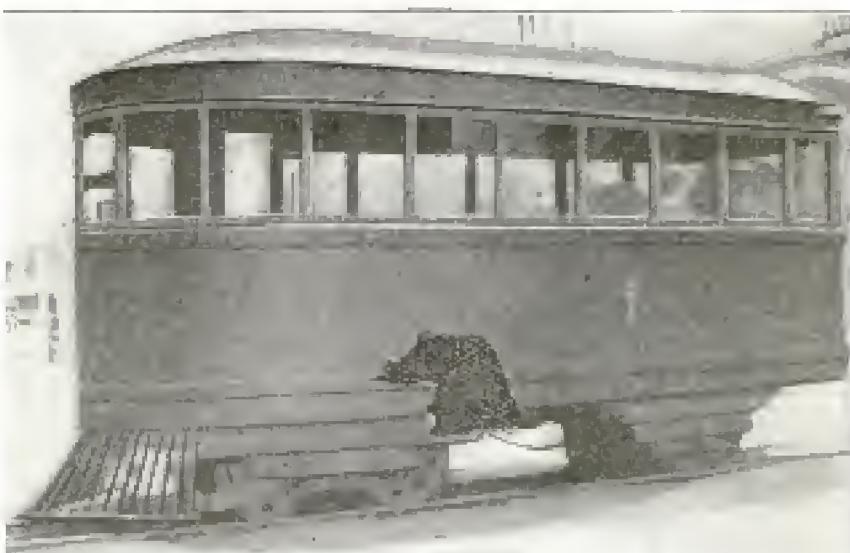
7802

Motor

HAITIAN STREET CARS BUILT FROM AMERICAN AUTOS

Street cars, built from American automobiles, are being operated in Port au Prince, the capital of Haiti, with great success. The complete chassis, motor, and transmission were used, except that the gearing from the original rear axle to the 32-in. drivewheels was reduced, so that the axle and wheel sprockets are the same size. This greatly increased the available power. The cars weigh 7,250 lb. and can attain a speed of 40 miles an hour. They have proved so successful and economical that the sugar company, which operates all the street cars and railroads of Haiti, contemplates using similar cars to haul sugar, in

place of the old steam locomotives which consumed so much coal.



One of the Street Cars, Used in Port au Prince, Haiti, Which were Built from American Automobiles, Using the Complete Chassis and Power Plant; They have Proved a Great Success in Solving the Transportation Problem and may be Adopted Also for Railroad Traffic

Dodge Bros. Motor Car Co.
Dept. of Publicity, Detroit
Copyright 1919 by Popular Mechanics Co.

Mr. Schermer, London Times Trade & Sutton, England. \$554 Eng. Supplement
728 POPULAR MECHANICS 2/18.

PROJECTILE POCKET PISTOL IS LIFE-SAVING APPLIANCE

In case of shipwreck, a few minutes' delay in sending a line to the vessel may



Above: Two Steel Boxes Hold the Complete Outfit. Below: Left, Inserting the Firing Cartridge in the Pistol; Right, Inserting the Self-Propelling Rocket with Line Attached

mean life or death to those on board. A line-throwing rocket pistol has now been devised which, with all equipment, weighs less than 50 lb., and is easily portable. The pistol is fired from the hand. A small cartridge projects the rocket from the barrel of the pistol and ignites the charge in the rocket, which then becomes self-propelling, carrying the line in the direction required. A length of flexible wire connects the line to the rocket.

LARGEST FELT-WEAVING LOOM EVER CONSTRUCTED

A felt loom, said to be the largest of its kind ever constructed, has recently been completed at Worcester, Mass. The loom is for weaving continuous tubular paper-makers' felts, up to a width of 40 ft. The finished machine weighs 18 tons, and will require two freight cars for its shipment.

TRANSMISSION LINE TO SPAN STRaits OF MESSINA

Industrial expansion in Sicily demands the introduction of more electric power, and a 120,000-volt transmission line has been proposed, which will come from Italy by crossing the Straits of Messina. The span would be 3,770 yd., or about $2\frac{1}{4}$ miles, and the cables of nickel or zinc-plated steel, each cable being supported on individual masts. These masts would have to be 900 ft. in height, to provide a 150-ft. clearance for passing ships in the center of the estimated 660-ft. sag. At present the most difficult feature of this huge engineering problem seems to be the construction of strain insulators which will be strong enough to hold the vast weight of the steel cables. However, if this contemplated project can be realized, Sicily will receive approximately 50,000 kw. of power for manufacturing purposes of all kinds.

MUSSELS ON SHIP BOTTOM CAPTURE SMALL FISH

Capturing three fish about the size of sardines was the curious exploit of as many sea mussels, which had attached themselves to the iron bottom of the famous exploration ship, the "Albatross," of the U. S. Bureau of Fisheries. This vessel had lain in San Francisco Bay for some time when it

was decided to condition it for sea duty, but it was found necessary first to put the ship in drydock to clean the hull of the mussels.

On the 30-mile trip to the Mare Island Navy Yard, the vessel must have passed through a school of anchovies, for several of these fish were found

entangled on its bottom, and three were held firmly by the head in the shells of the mussels. This curious phenomenon must have been purely accidental, as neither the fish nor the mussels were capable of eating the other.

Is Dallas Hanna, Academ. of Science, Escondido Estate Park, San Francisco, Calif.

Christian Science Monitor Cont.
8/16/18

9 Science, Escondido Estate Park
San Francisco, Calif.

7780 ent A. Es Clutterbuck
Waimia Kauai, S. H.

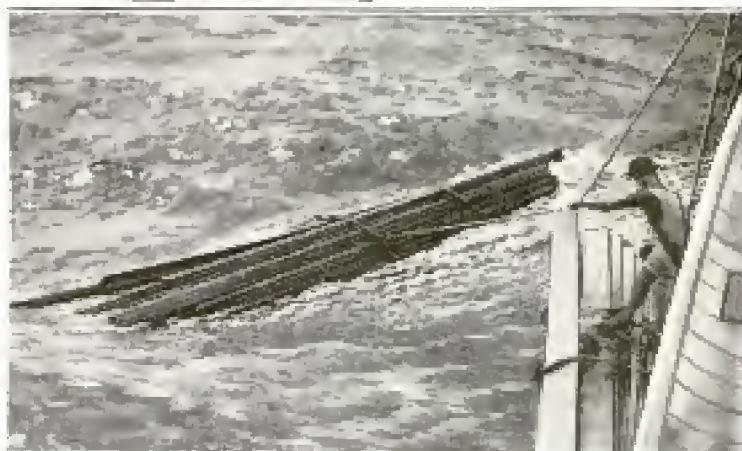


Because of the Danger from Heavy Surf, the Schooner Anchors About a Mile Off Shore, Where the Lumber is Made Up into Rafts. These are Cast Overboard, to be Towed Ashore by a Small Launch Which can Venture Close to the Surf without Fear of being Damaged

HOW KAUAI IN THE MID-PACIFIC GETS ITS LUMBER

THE demand for lumber for building and other purposes in the Hawaiian Islands is enormous, and owing to the fact that neither hard nor soft woods can be produced in commercial quantities, the islands have to depend entirely upon importations. Because of the lack of harbors on the island of Kauai, interesting and somewhat primitive means of landing a cargo have to be resorted to.

The lumber schooner anchors about a mile from shore, beyond



The Rafts are Assembled at the Side of the Schooner Until the Launch Is Ready to Start for the Shore



The Rafts are Arranged on Both Sides of the Launch Ready for Towing, and a Harness is Passed over the Bow of the Launch in Such a Way That the Rafts can be Cast Off by Reversing the Launch

the breakers, and the lumber is made into rafts and jettisoned into the shark-infested ocean. The rafts are secured by the natives and lashed together. They are then "harnessed" over the bows of a motor launch, and the craft proceeds shoreward with its load of about 10,000 board feet. On approaching the shore, the rafts are cast off, and the launch goes astern, while Hawaiians,



After the Rafts are Cast Off by the Launch, Expert Swimmers Come Out from the Shore and Secure Them to Buoys Until They can be Warped Ashore and the Lumber Hauled Up on the Sandy Beach, Where It is Soon Dried by the Tropical Sunshine

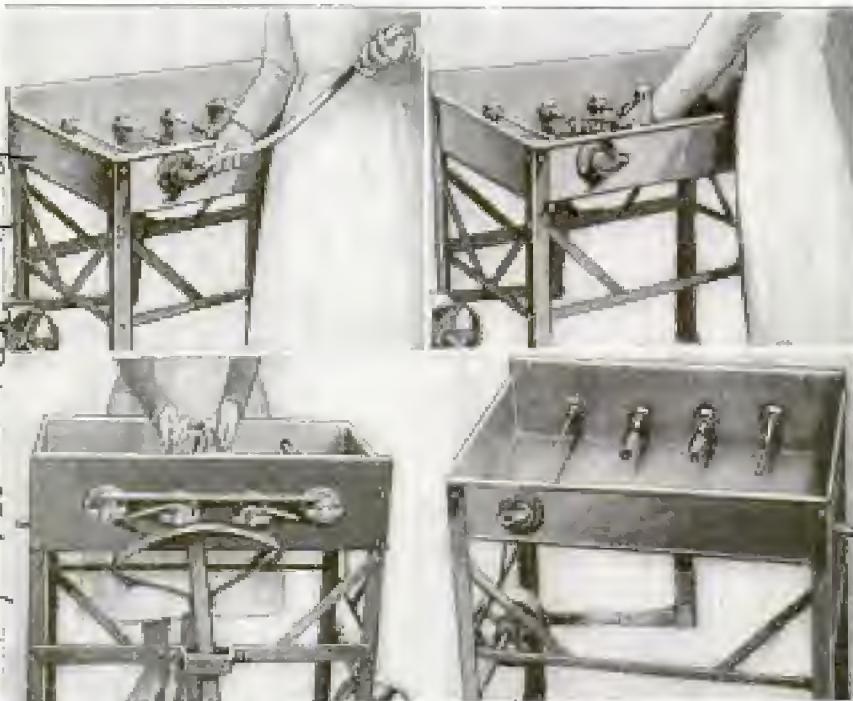
who are notoriously good swimmers, swim from the shore, secure them to buoys, and warp them to the sandy beach. The lumber does not suffer from its im-

mersion, and it is creditably reported that this is the only place in the world where such means of landing a cargo have to be resorted to.

MILKING-MACHINE WASHER IS RAPID AND SANITARY

By W.
Milking machines must be washed after every period of use, to prevent their becoming sour and insanitary, and a washer

which does this work rapidly and efficiently has been produced by an eastern manufacturer. The machine consists of four cleaning brushes, two for milk tubes and two for teat cups, the whole being attached to pulleys belted to an electric motor or other source of power. These brushes revolve at a high rate of speed, two revolutions to the right and then two to the left, and are constantly immersed in a container filled with an antiseptic, or sterilizing, solution. It is said that the reversing action of this machine insures a longer life to the brushes than is the case with the usual rotating washers, and that the apparatus is so simple a child can operate it effectively.



Upper Left: Placing Long Rubber Tube of Milking Machine on Special Brush. Upper Right: Washing Teat Cups. Lower Left: Cleaning Short Rubber Tubes. Lower Right: Four Brushes of Washer, Illustrating the Different Sizes and Shapes Required to Properly Clean the Milker

Several trial gas installations for cooking in Canal Zone quarters are to be made by the Panama Gas Company. Mains have been laid from Panama and the laying of pipes is now going on.



Above: A Two-Cylinder Gasoline Engine Furnishes the Power for Driving the Tractor Belts Which are Provided with Wooden Cleats. Right: Passengers and Operator Ride on the Toboggan and the Power Unit Propels It by Pushing from the Rear

TRAVEL SNOW-COVERED ROADS WITH MOTOR TOBOGGAN

A motor toboggan has been invented by a Maine man which is expected to solve most of the transportation problem in localities subject to heavy snowfalls during the winter. The passengers and operator ride on the toboggan, at the rear of which the power plant is fastened by a flexible connection. Power is supplied by a 15-hp. engine which drives the tractor tread, consisting of a rubber belt equipped with metal or wooden lugs. Trials have shown that a speed of 30 miles per hour can be attained. Fuel consumption is at the rate of 45 miles to the gallon of gasoline. The weight of the toboggan, in passing over loose snow, packs it so the treads have a firm grip.

8616 NEW YORK APARTMENT HOTEL WILL HOUSE A CHURCH

That the bright lights are not the attraction for all visitors to New York is shown by a recent announcement that an apartment hotel is to be built, in which part of the three first floors will be occupied by a church. The church-hotel will be 17 stories high, with the usual hotel lobby on the first floor. The church will have a separate entrance on the first floor and will occupy most of the space up to the level of the fourth floor. The remaining floors will be arranged for hotel accommodations, divided into suites of not more than four rooms and bath, with single rooms for transients.

NEW TOOTHBRUSH CLEANS ALL SURFACES OF THE TEETH

8669

In one form or another there have been toothbrushes almost as long as there have been teeth, but hitherto in all forms it has always been necessary to replace them from time to time. Now there is a new form of toothbrush that is almost everlasting, only a small part of it having to be renewed. This renewable part is a small attachment that holds the bristles of the brush in a semicircular ivory frame that is rotatively connected to one end of a metal handle, so that it will move into any position that best suits the form of the teeth. The points of the bristles are semicircular like the frame, and straddle the teeth, cleaning the top and both sides.



Toothbrush with an Everlasting Metal Handle, and a Renewable Semicircular Brush Attachment

Bidental Products Co.
85 Columbia St., Newark, N.J.

W.H. Jones
3/6/22 Page 2

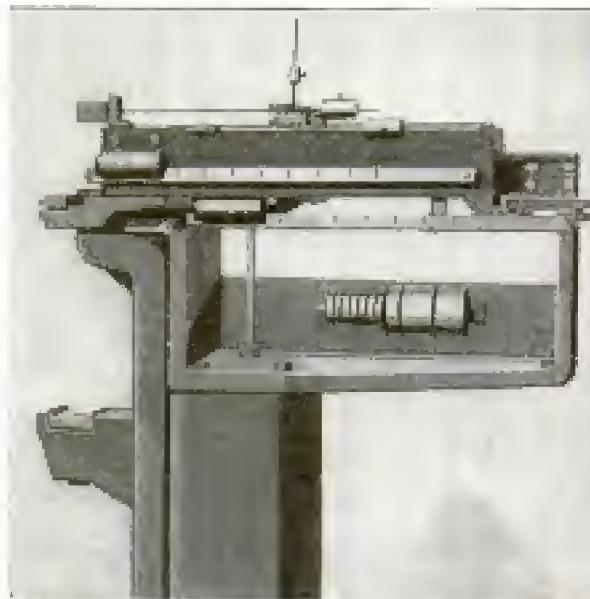
I. W. A. H. Timery,
Istebrook, Conn.

80⁷²²
59

POPULAR

AN IMPROVED FORM OF SCALE WEIGHS RUBBER TIRES

In the manufacture of rubber tires, just sufficient rubber should be supplied to fill the mold, and any excess used results in



The Short Metal Arm Replaces the Usual Platform and is Used for Weighing Rubber Tires on Their Metal Cores

waste. By weighing the tires on their metal cores before they go to the molds, the exact amount of rubber required can be determined. To do this accurately a scale has been devised which has a short arm projecting from one side, on which the tire is hung and weighed just before going to the mold. The scale is designed to maintain its accuracy under rough usage, and the usual knife-edges are replaced by metallic spring plates.

Commerce Report

3/6/22

MECHANICS

8628

AUTOMATIC AND SHUTTLELESS LOOM MADE IN ENGLAND

A new automatic shuttleless loom, which its English inventor claims will revolutionize the cotton-manufacturing industry, is reported now ready to be placed on the market. It is said that this loom weaves automatically cloth better in appearance by 25 per cent, and with about double the production of existing looms. Two different kinds of yarn, or two different counts, can be put in for effects, and with the attachment of a simple color mechanism, 6 to 10 colors can be put in by the same plain loom. It is also claimed that waste is reduced to practically nothing.

8526

COMBINED THRESHER-BALER SAVES TIME AND MONEY

Threshing peas and baling the pea hay in one operation is possible with a machine which has lately been introduced by a Missouri farmer. The implement is placed beside a stack of the hay in the usual manner, the peas are threshed and come out of a spout into waiting sacks, while the hay is carried through the wind stacker and dropped on the baler. The whole is driven by a tractor of 10-18 hp., a belt from an extra pulley on the wind-stack shaft furnishing the power to operate the baler. With all parts of the outfit placed in a position to reduce the labor of handling to a minimum, it is said that a considerable saving of time and money can be effected, thus making the machine a valuable aid on the farm.



Combined Thresher-Baler, Showing the Manner of Placing the Units to Reduce Labor; At the Extreme Right is Seen the Tractor Belted to the Thresher, While at the Left is Shown the Baler Also Belted to the Thresher

I. W. S. Casebolt, Poplar Bluff, Mo.
Copyright 1922, I. W. S. Casebolt

Photographs at Oregon + Minnesota
Combined Threshing + Baling Machine
I. W. S. Casebolt

Cmd. Wendell M. Whiting,
Hydrographic Office, Navy Dept.
POPULAR MECHANICS
Washington D.C.



Left: The Hydrographic Map is Made by Surveying the Land and Making Soundings of the Water Near By. The Areas of Water of Different Depths are Shown by Different Shadings. Right: The Airplane Photograph of the Same Locality in Which the Areas of Shallow Water Appear of Lighter Shade than the Deep Water. The Photograph is Used to Check the Survey Map and to Discover Changes

8066 **CHECK HYDROGRAPHIC SURVEY BY AERIAL PHOTOGRAPHS**

It has recently been demonstrated that aerial photographs can be used as a simple and satisfactory check on hydrographic maps. The map shows the land and the depth of the water around the land, the areas of different depths being represented by different shadings. A photograph of the same locality, taken from an elevation of 5,000 ft., will provide a ready means of checking the data on the map, as the areas covered by shallow water will appear of lighter shade than the deeper water. If radical differences are noted, such as a change of a deep channel, or new shoals appearing, a new survey becomes necessary.

8641 —
FISH-MARKET SURVEYS MADE BY BUREAU OF FISHERIES

Surveys of the larger cities of the United States to ascertain their fish distribution and consumption are being made by the Bureau of Fisheries, which issues bulletins on the subject that are of great value to the commercial-fishing industry. A survey has already been made of the Chicago market, and a more recent one of the Twin Cities of St. Paul and Minneapolis. There the fish supply comes

mainly from the Canadian lakes to the north, and from the North Pacific coast. A total of 86 carloads of fish, besides 21 of oysters, weighing 2,841,212 lb., was received in the Twin Cities during the year ended Sept. 30, 1921. These fishery products were handled by 360 firms, of which 11 are in the wholesale business, 5 in the wholesale and retail business, 32 in the retail business handling fish every day, and 312 handling it part of the week.

8396 *Access Gray*
AUTOMOBILE ASH RECEPTACLE CONVENIENT FOR SMOKERS

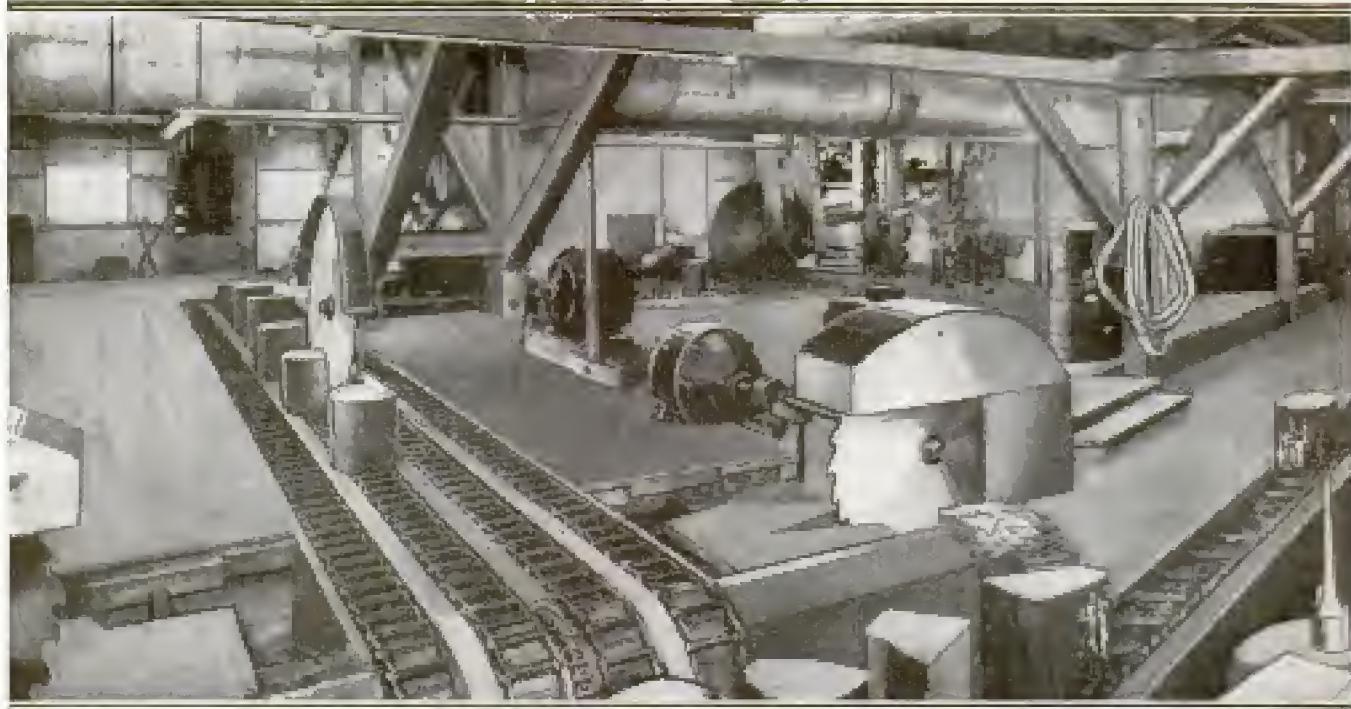
Conveniently mounted on the dash of an automobile for smokers in the front seat, or on any side wall, or other flat surface for those riding in the rear seats, is a new device that acts as an ash receptacle and a cigar and cigarette case holder. The ash container has a lid that flies open at the touch of a button, and when open has a winged apron that prevents ashes from blowing into the car.



The Hargo Co., Inc.
Ripon, Wis.

8544

Hunting. Merritt Lumber Co., Ltd.
Vancouver, B.C., Canada



Panoramic View of Shingle Mill: In the Background, About at the Center of the Left-Hand Picture, Is the Log Slip to the Splitting Saws. Near the Knee Bolters at the End of These Conveyors, in the Immediate and Passes the Prepared Log Sections to the 14 Shingle Machines

MILL CUTS 500,000 SHINGLES DAILY

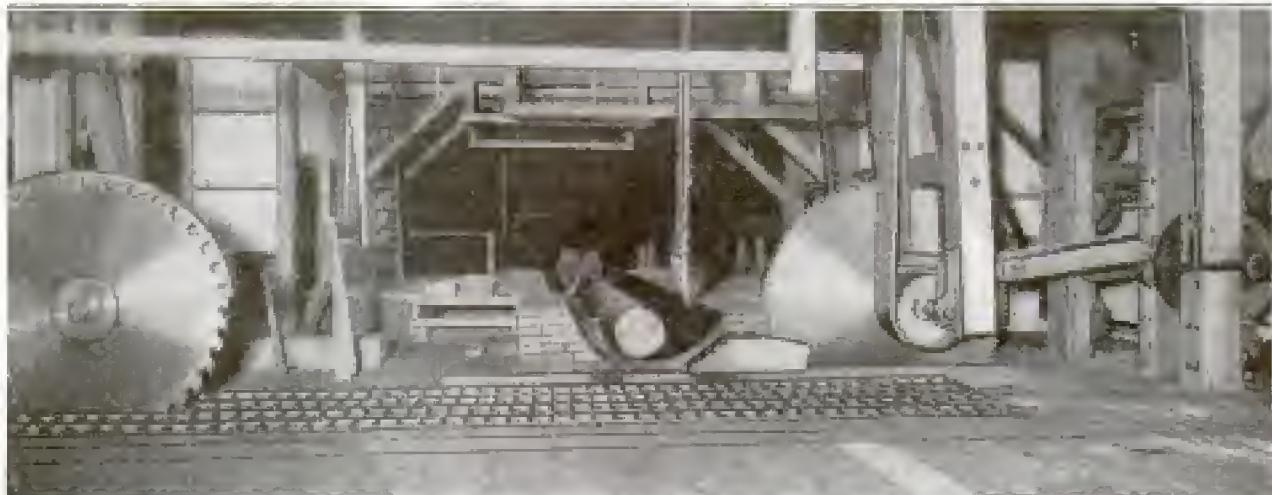
By HENRY C. COPELAND, 106 W. 11th Bldg.,
Vancouver, B.C.

IT is a far cry from the days when the pioneer went forth with his frow and mallet to split cedar shakes with which to cover his roof, to the shingle mill recently put in operation at Vancouver, B.C., which cuts 500,000 every ten hours.

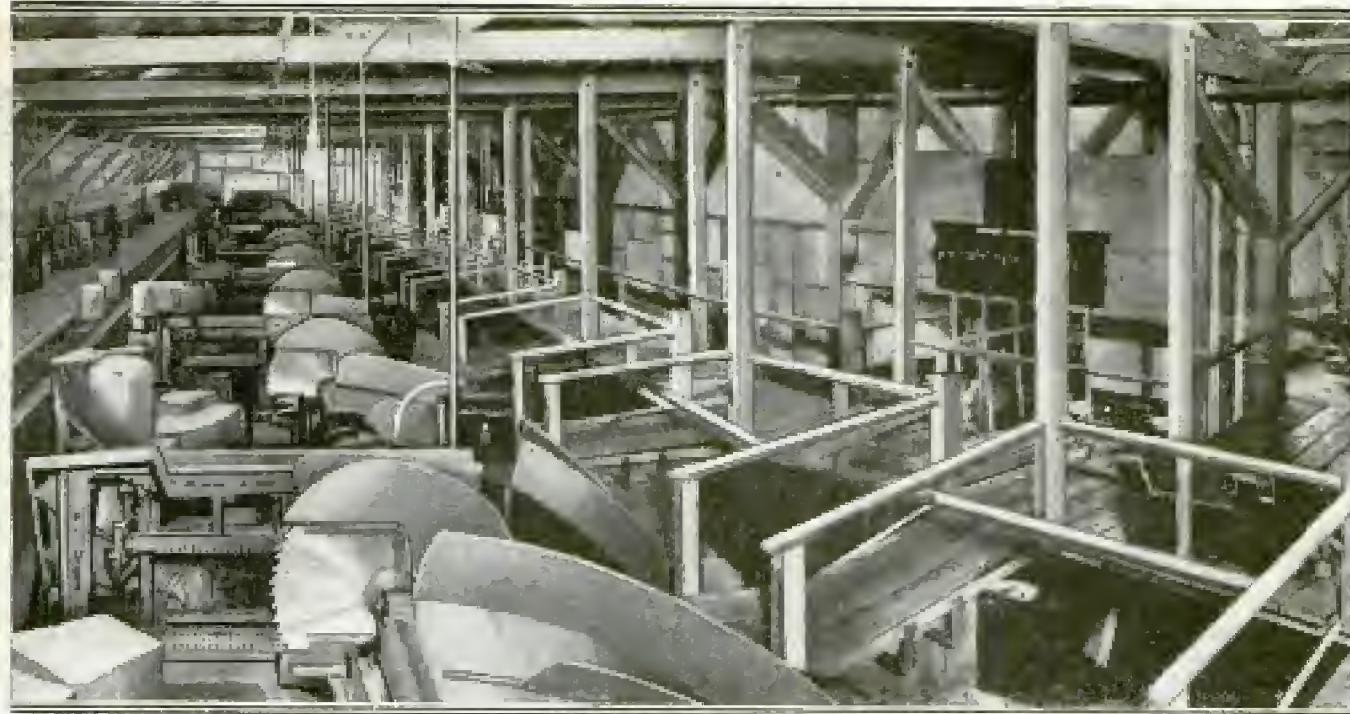
The cedar logs, ranging all the way from $1\frac{1}{2}$ to 6 ft. in diameter, are floated to the foot of the log slip. There one end of a log is caught by the dogs on an immense endless chain and the log is drawn up the slip, other dogs engaging it as it goes up. If the log is not in the right position as it comes to the end of the slip, there is an overhead canting device which lowers a heavy wire cable and

hook, by means of which the log is turned to place. Just to the right of the end of the log is a swing, circular cut-off saw 7 ft. 2 in. in diameter.

The saw is automatically set to cut 16, 18, or 24-in. lengths from the log; a thrust on a lever, and the saw is forced against the log. If the log is too large for the saw to cut off entirely, another lever is pulled, and an ax comes down and splits off the part sawed, whereupon the canters rolls the log for another cut. This operation is continued until the first length is cut completely free from the log, when the latter is moved ahead for another cut.



At the Right Is the End of the Log Chute by the Side of the 86-Inch Cut-Off Saw. To the Left of That Are the Steam Ax, the Control Levers, the Log Slip, and the Chain Conveyors, with the First Splitting Saw at the Extreme Left



and the 86-Inch Cut-Off Saw. To the Left of This Are the Chain Conveyors in the Floor That Carry the Cut-Off Logs Foreground, Is Another Conveyor at Right Angles, That Extends the Whole Length of the Mill, to the Right of It. At the Extreme Right Is the Filing Mill.

The blocks fall onto a chain conveyor in the floor, and a workman with a pick-a-roon centers it so that the first splitting saw halves it. As the block arrives at the end of this conveyor, another man switches it onto another conveyor running at right angles to the first.

If the blocks are so large that they need splitting again, they are centered on this conveyor and again split. They next arrive at the knee bolters, where they are trimmed of all bark and rotten spots ready for the shingle sawyers. The knee bolters work in a pit, so that the blocks do not have to be lifted. From the bolters they are placed on the conveyor and passed along to the 14 shingle machines. The conveyors from the cut-off saw to the splitters and then to the knee bolters give more efficiency with three men than was obtainable with 10 under the old system.

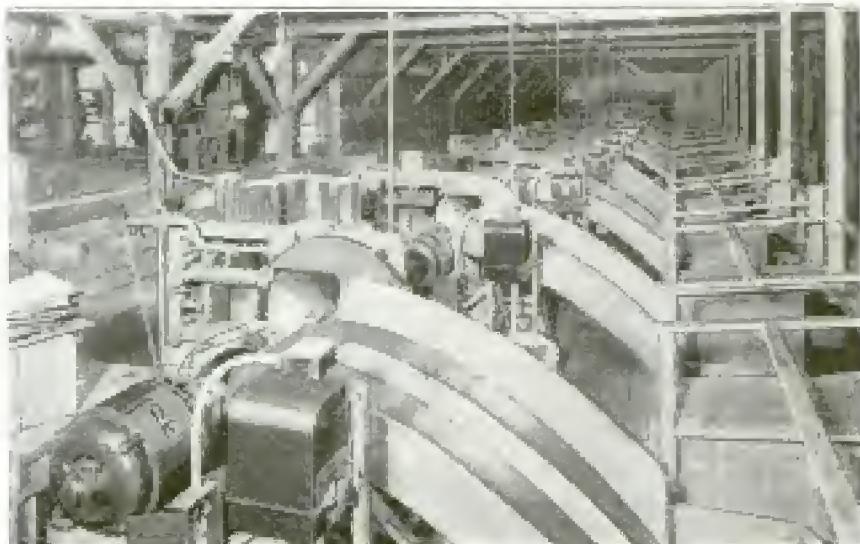
The prepared shingle blocks are placed in the grip of the shingle machines and are automatically sawed into shingles. The operator takes the shingles as they fall and "joints" the edges on a small saw in front of him. They are then tossed down the chute to the packer, or "weaver."

As each bundle is packed, it is placed on a gravity conveyor, and by

means of these conveyors and other live conveyors, is carried to the trucks ready for the dry kilns. The trucks go into one side of the kilns and out at the other, then to the repacker and into the car.

JULY 22 FIND INDICATIONS OF POTASH WHEN DRILLING FOR OIL

While drilling for oil recently in Texas, the drill passed through strata which showed a considerable amount of potash. Unfortunately the samples taken did not give complete information as to the thickness of the deposit. Further investigations are now in progress which may develop new potash areas at a considerable distance from all known Texas deposits.



Row of 14 Shingle Machines, Showing the Chutes Down Which the Finished Shingles Slide: The Saw at the Right of the Machine Cuts the Shingles. Each Machine is Driven by Two Motors.

*Franklin Institute
Journal
Copyright 1922 by Franklin Institute*

Mfr. J. Rhamstine
2152 E. Larned St.

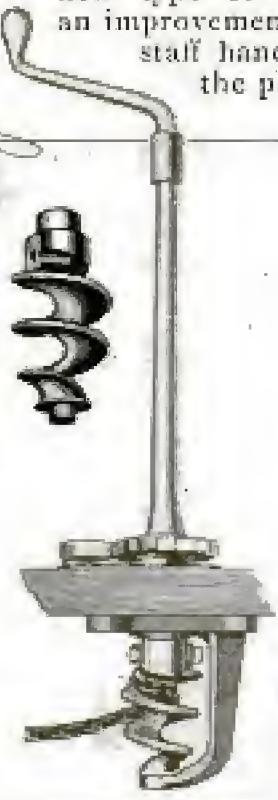
736 Detroit POPULAR MECHANICS
Mich
ORDINARY RECEIVERS USED
WITH NEW AMPLIFIER

Any standard head set may be attached to branches of a new radio-amplifier, and held in position by two knurled screws, which are rubber-covered to prevent damage to the receivers. As a rule, persons who buy amplifiers generally have a head set which is thereafter not needed, but with this new loud speaker, the old instruments can be utilized. The sound from the two receivers of matched tone is usually greater and less distorted than when but one is used.



846!
FREIGHT AND PASSENGER-CAR
HIGH-POWER STAFF BRAKE

For both steam and electric roads, a new type of hand-brake drum is an improvement over the old simple staff hand brake. In place of the plain winding staff is a grooved winding drum. The radius of the drum is large at the upper end, to provide for quick take-up of the brake chain, and tapers down to the lower end. The drum has a winding power about $2\frac{1}{2}$ times that of the plain staff.



Ackley Brake & Supply Co.
50 Church St. New York

ing the first nation so to honor these faithful animals.

Chicago Tribune
3/10/22

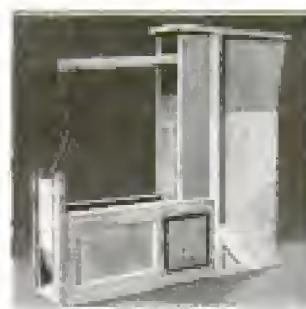
8620

COURT HOLDS THAT JAPANESE
BORN HERE MAY OWN LAND

A decision recently handed down by a California court holds that Japanese born in this country are entitled to own land here. This is the first decision of this kind in California and is based on the Constitution of the United States, which says that all persons born here are citizens. In the case cited, the Japanese father advanced money to his children, who were born here, for the purchase of land. It is hard to say what will be the effect of this decision in California, with its 100,000 Japanese population.

846!
RATS CAUGHT AND DROWNED
IN NEW-STYLE TRAP

Catching and drowning rats at the same time is accomplished with a trap of late introduction. The trap is built in the shape of a perpendicular "L," and has a small screened runway through and up which the rodent must crawl to get near the bait.



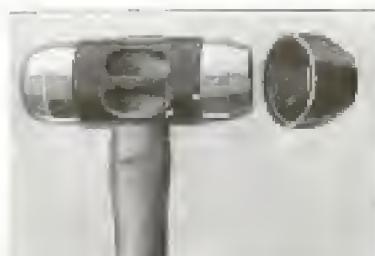
When the rat arrives at the top of the runway and strives to reach the tempting cheese, bacon, or other bait, the animal is precipitated into a galvanized-iron tank filled with water, and drowned.

855!
SOFT-FACE FLOGGING HAMMER
HAS MOLD FOR REFACING

A soft-face flogging hammer that has a mold in connection with it, so that it can be readily refaced, is now on the market. On

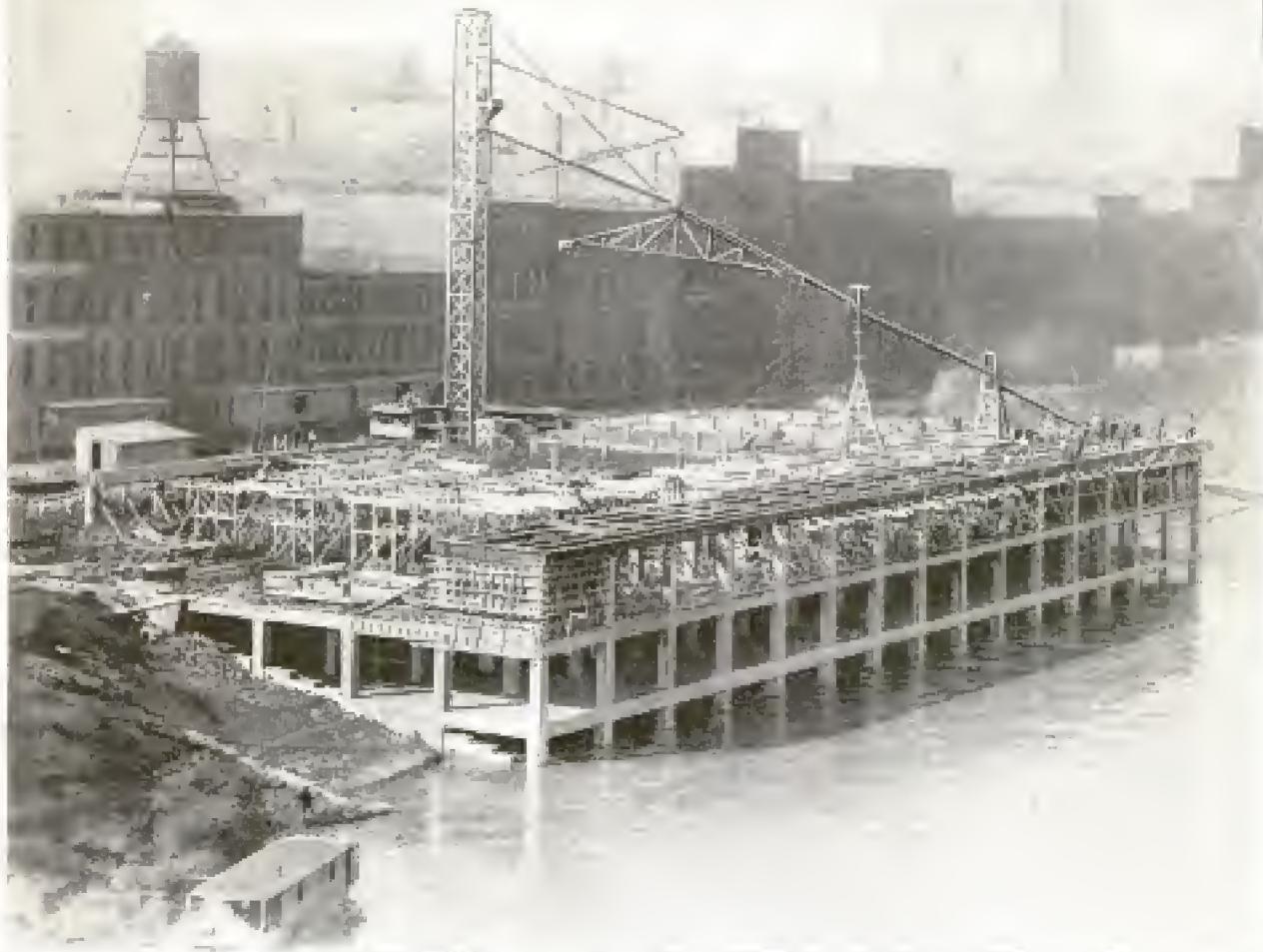
its hickory handle the hammer has an iron head, strengthened to stand hard usage, on each end of which is molded a

special antimony-lead face, the whole being well balanced and of ample weight. The iron mold that goes with the hammer is so shaped that it will slip over either of the soft ends, and form a mold for pouring molten lead so as to form a new face. It is stated that this can be done in three minutes.



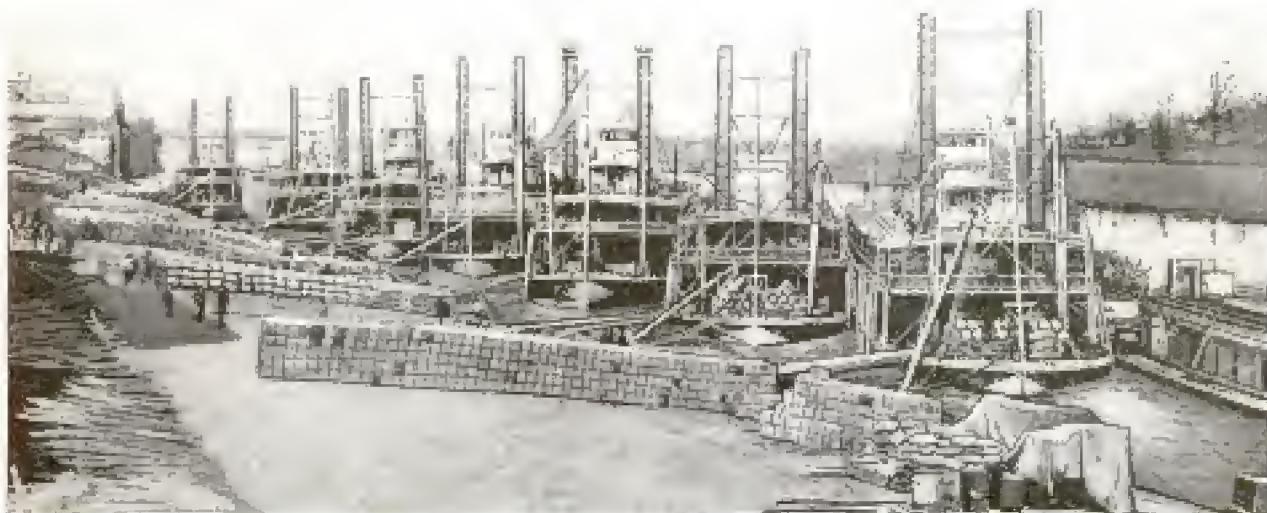
Maywood Machine Work
Copyrighted material
Medium Av. Maywood
Ill.

8441 cont. R. es. Fields
c/o The Banner, Nashville,
Tenn.



MUNICIPAL RIVER TERMINALS ERECTED AT NASHVILLE

CONSTRUCTION work on the Nashville, Tenn., river terminals, which has been in progress at the municipal wharf since last June, is now nearing completion. Three of the four floors are practically finished, and small quantities of freight have already been stored on them. The terminals are being erected by the city at a cost of nearly \$240,000, and will be of great value to the native shippers and receivers, as well as to the railroads and steamboat companies. Farm products will be the bulk of shipments down the Cumberland River from a hitherto undeveloped part of this state and Kentucky, and transferred through the terminals to the railroads for dispatch to their destinations, or to buyers for local use. Above is seen the municipal terminal during construction, while below is a view of the river terminal in 1862, when steam-boats were landing war supplies.



h-u. Turner 3/10/22

8642

P. 7 + 26.

FIRST AUTO SHOW IN CHINA HOUSED IN BAMBOO SHED

Very characteristically, the first auto show in China was housed in a huge



Top: The Huge Shed during Process of Construction, Showing the Large Bamboo Arches Supported by Slender Uprights of the Same Material.
Below: Several of the Exhibition Booths at the Auto Show

shed built entirely of bamboo. Arched bamboo ribs with a very large span were supported at several points by slender bamboo posts. In that respect it was very Chinese, but when completed, with its well-furnished booths filled with American and European cars of the latest models, equipped with conspicuous signs in English, and illuminated with a large number of electric lights, it had very much the appearance of an automobile exposition such as one is accustomed to see in Europe or America.

Tracks of prehistoric animals have been found recently on rocks in Kentucky, between the Kentucky and Cumberland rivers.

TO WIRE APARTMENT HOUSES FOR RADIOTELEPHONE

As an indication of the growing popularity of the radiotelephone, a real-estate firm of New York announces that it will wire several apartment houses for this service. The builders say that it will be better for them to erect one aerial for the use of all tenants than to have the tenants erect individual aerials. A building contractor of Philadelphia also announces that buildings being erected by him are to be wired for radiotelephone service as part of the regular equipment.

8639

EMPLOY OLD RAGS IN NEW PREPARED ROOFING

That a waste material may become one of the necessary ingredients of a great industry is shown in the manufacture of prepared roofings, as old rags form the basis of the finished roll or shingle. The rags are collected by dealers and shipped to the factory, where they are sorted and reduced to a pulp which is made into a fabric or felt. Hot asphalt is then forced through all the pores of the fabric, and a coating of asphalt is

applied on both sides. The wearing surface is then coated with crushed slate, or other stone, which is pressed firmly into the asphalt coating.

8652

OILED WRAPPERS FOR APPLES STOP FORMATION OF SCALD

Scald, which is a transportation and storage disease of apples, is caused by gases given off by the apples themselves, but can be prevented by the use of oiled-paper wrappers. Tests have shown that the wrappers should carry 15 to 20 percent of oil in order to be effective in preventing the development of scald. These oiled wrappers are not to be confused with wax-paper wrappers.

Dept. of Agriculture
Clip Sheet No. 99

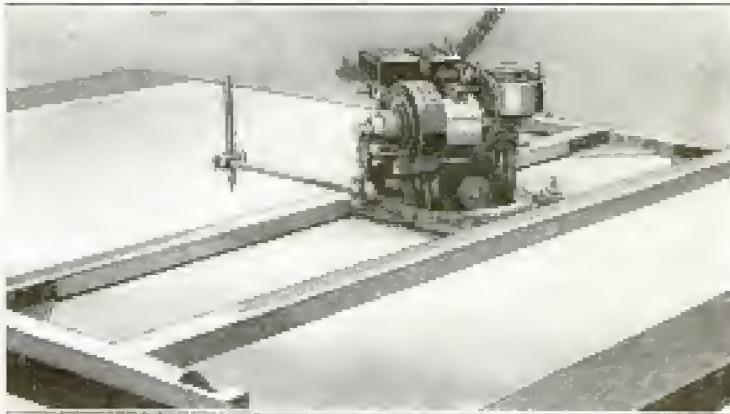
8236 I no. Admiral Villiers, British Navy
Sold by Perry Isoscope Co Ltd.
London, England.

Equip

POPULAR MECHANICS

INSTRUMENT DRAWS ON CHART COURSE OF SHIP'S VOYAGE

For many years there have been in use odometers, or instruments for measuring the distance traveled by vehicles, and now there has been invented in England an odograph, or instrument for drawing to scale on a chart the course traveled by a ship. The instrument consists of a carriage on casters which has a magnetized propelling wheel supported centrally in a revolving frame carrying an index or pointer in the plane of the wheel corresponding to the ship's head. This is first set by hand on the chart to agree with the true course obtained by the ship's compass. After that it always follows any change in direction of the ship's head, and records it on the chart by means of a pencil in a carrier attached to



Instrument That Automatically Draws on a Chart the Course Traversed by a Ship at Sea: Everything is Timed and Adjusted So That the Pencil Draws the Vessel's Course Exactly to Scale

either side of the carriage. The forward motion of the carriage is at a speed in proportion to the speed of the vessel. The carriage is connected to two rails which extend across the chart to other

rails at right angles to them, one on either side of the table that supports the chart.

8494 *As above*

AUTOMOBILE TOWING TONGUE STEERS AUTOMATICALLY

Disabled automobiles, limited in number only by the engine power of the



Automobile Towing Tongue Which Automatically Steers as Many Disabled Machines as the Wrecking Car can Pull Back to the Garage

84158

ADVERTISING STUNT TESTS FLOOR COVERING

Not content with subjecting his floor covering to foot traffic by placing a strip of it on the sidewalk, an enterprising merchant placed strips of the same covering in the street, where it was exposed to heavy automobile and wagon traffic. Careful count was kept of the number of vehicles passing over the strips. This, in one case, amounted to 17,000, but the strip showed little evidence of wear.



In Order to Show Its Wearing Qualities, Six Pieces of Floor Covering were Placed in the Path of Traffic at the Intersection of Two Busy Streets

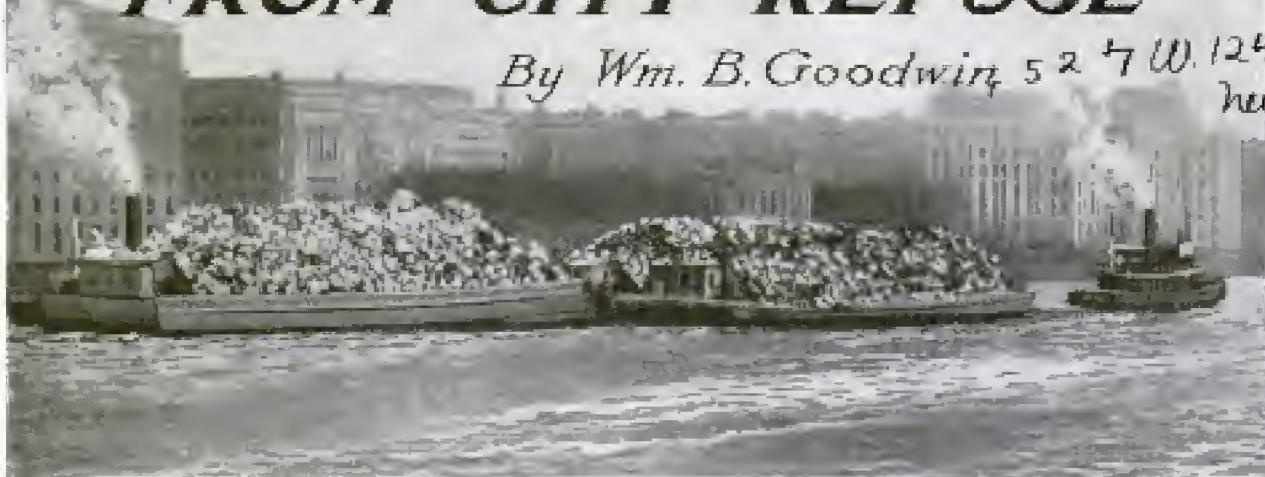
Paraffine Co., Inc., San Francisco,
Calif.

The Young Magnetic Distributing Co.
General Agent, S.C.

743⁸

MAKING AN ISLAND FROM CITY REFUSE

By Wm. B. Goodwin 527 W. 124th
newyork
City



Scows, Loaded with New York City Refuse, being Towed up the East River to Riker's Island, Where the Refuse is Dumped in Very Large Quantities: This Island is being Made Ten Times Its Original Size

PROBABLY the most complex and unusual formation which is used for raising crops and for other purposes, is situated in the East River, New York, and known as Riker's Island, or Municipal Farm.

In looking about for a place to dispose of the vast accumulation of waste materials discarded by the thousands of households, the street-cleaning department of New York City decided that if refuse



Looking East from the River at the Municipal Farm Tower Which is Occupied by an Officer Who Reports Irregularities, and Arrests Anyone Attempting to Bring Narcotics to the Occupants of the Farm

were placed on this island in sufficient quantities, it would provide a place on which to erect buildings and for raising crops.

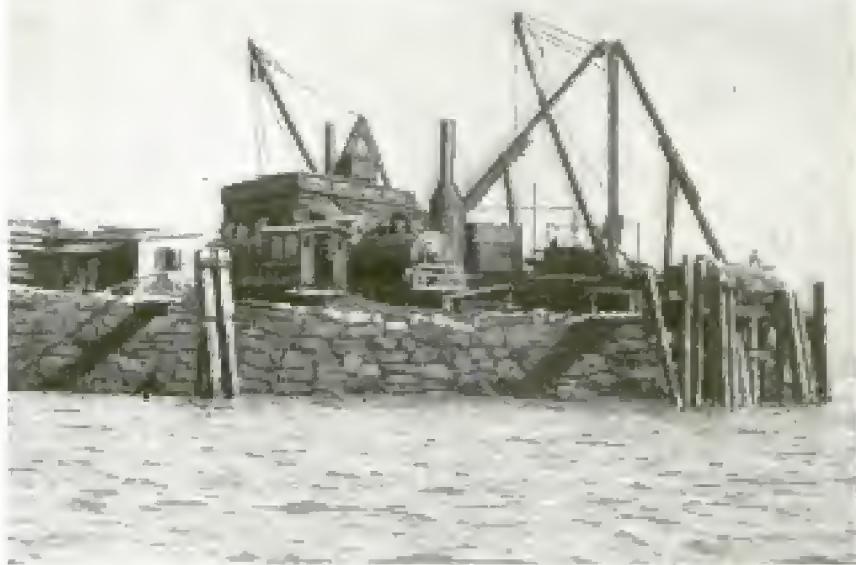
In 1895, the first household refuse was deposited there. Since that time more than 22,500,000 cu. yd. have been added to that plot of ground, which originally consisted of only 60 acres and will eventually be extended to some 600 acres. The material dumped consists of ashes, glass bottles, tin cans, dishes of various sorts, earthenware, beds, mattresses, baby carriages, iron wire, waste paper, wooden boxes — in fact, all household refuse except garbage, which is taken elsewhere.

This refuse is collected from the streets in horse-drawn carts and auto trucks, taken to various docks, dumped directly onto scows, which are towed up the East River to the Municipal Farm and unloaded at two points on the island. It is taken from the scows with steam-operated cranes with dump buckets and placed upon small cars which are easily unloaded by tipping sideways, allowing the con-



Part of Riker's Island, Showing High Hills Formed by Dumping New York City Refuse There, and Clouds of Smoke from Ever-Present Fires

tents to slide off quickly. Thus hand labor is practically eliminated. The distribution of the refuse over the island is done by contractors under the supervision of the street-cleaning department. From this mass of material, things of value, such as money and jewelry, are sometimes picked up by workmen. Thirty per cent of the city's refuse is disposed of here, the remainder going to other places. The top surface of the island is covered with ashes and makes a



Landing Place and Equipment:
Watchman at Right of Derrick
Reports Presence of Anyone At-
tempting to Land on Island from
Boats



Loaded Cars Leaving Dock:
About 50 Such Cars Are in Con-
stant Use for Hauling the Ref-
use from the Landing Dock to
Various Parts of the Island

soil which, in a fairly wet season, produces various vegetables, corn, and other crops. Hogs are also raised on the island, and plans are under way for increasing their number from year to year.

One hundred acres are now under cultivation. In places, the mass of refuse is 60 ft. high and forms an uneven surface, elevations and valleys having been purposely created. Soon after the first load of refuse was placed there, smoke and flames began to appear and have not subsided.

The smoke is carried long distances by the wind, accompanied with a disagreeable odor. No fires are set, but spontaneous combustion causes the flames to burst forth along the embankments where the filling-in work is done.

The Municipal Farm, or older part of the island, is under the supervision of the city's depart-



Embankment of Refuse Used in Building Up Riker's Island: Space to the
Left will be Filled to the Level of the Hills Shown on Opposite Page

ment of correction. A number of buildings, dormitories, hospital, jail, and a church have been erected, and at present house 500 drug addicts. These unfor-



In Foreground, Part of One Embankment; in Background Another; Space between Them will be Filled
tunates come from the city of New York.
After recovery, they are kept working on
the farm until the end of their period of
commitment.

sports

84/8 WATER GOLF IS LATEST FAD OF PLEASURE SEEKERS

Water golf, the latest fad of pleasure seekers, is played entirely on the water with the aid of a canoe and a floating tee. The tee, which is tied to the canoe, is placed in the water, the ball upon it,



Cmt. Frank B. Horne, 1/2 month after Calf
Left: Playing Water Golf. The Ball is Shown on the Floating Tee. The Player Is Ready to Make a Drive, with the Caddy Anxiously Awaiting Results, Which Not Infrequently Means being Tipped Out of the Canoe. Right: Illustrating How the Floating Tee is Tied to the Canoe

and then driven over the "fairway" in the direction (if one is fortunate) of the next "hole." The holes consist of markers that are anchored at specified distances apart. After the drive, the caddy paddles to the point where the ball has stopped, the player puts it on the tee again and makes another drive, and thus the game continues. Retaining one's balance in the canoe while driving is an extremely difficult feat, the frequent capsizing of these furnishing an amusing feature of the sport.

COMMUNICATION WITH LINER FROM TELEPHONE BOOTH

Long-distance wireless telephone equipment recently installed on the U. S. Shipping Board liner "America," furnished the means whereby newspapermen were enabled to talk from common telephone booths, to persons on the ship. During the conversation, while the vessel was 370 miles from land, the reporters' voices were carried over the usual wires to a transmitting station and thence by wireless. The incoming messages were wirelessly to a receiving station on shore, and relayed to the New York telephone exchange by ordinary methods. The feat served as a demonstration of long-distance equipment, which, it is predicted, will soon be in general use on ocean liners.

Detroit News 3/1
An attempt is being made to raise reindeer in the United States on a commercial scale, and a herd of 50 females and 10 males has just arrived from Norway on the way to northern Michigan, as a nucleus for the herd. For many years these animals have been raised in Alaska, but this is the first attempt to acclimate them in any of the states.

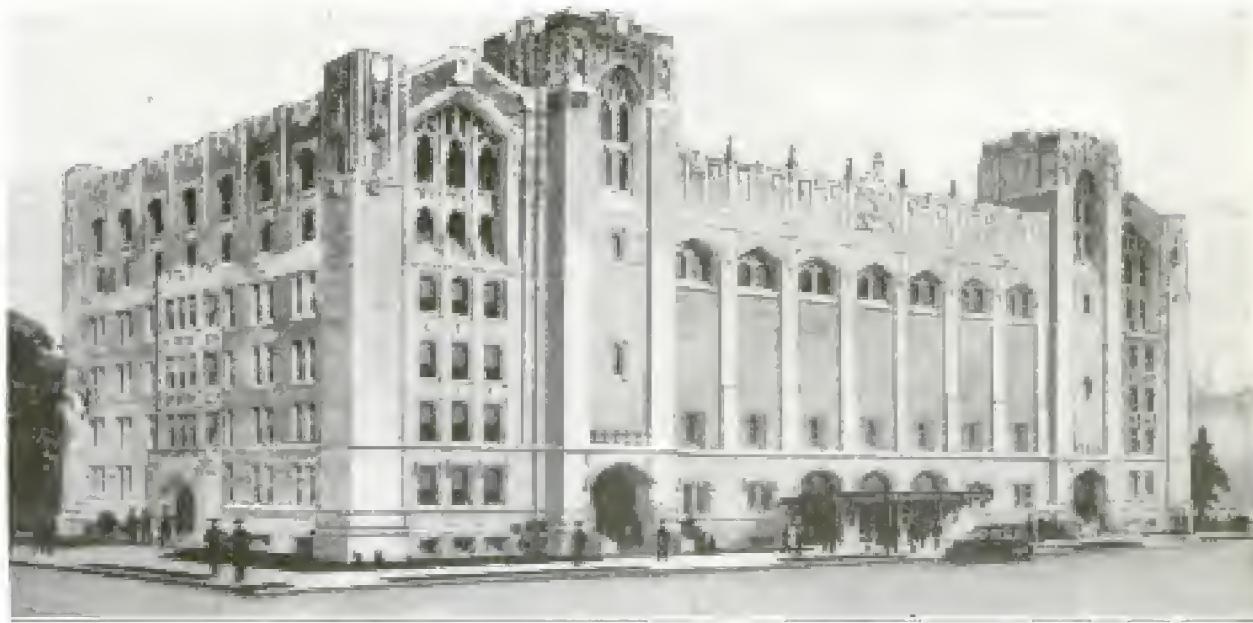


8691 Cont. Frank H. Williams

1920 Spy Run Ave.

POPULAR MECHANICS

Ford Wayne, Ind.
BEAUTIFUL FRATERNAL BUILDING FOR FORT WAYNE



BY combining resources, the fraternal orders of Fort Wayne, Ind., are to erect what will be one of the most costly Masonic homes in America. The building will occupy half of a city block, and will be in fact two buildings joined by a large auditorium for the common use of all Masonic orders housed in the building. The auditorium will have a seating capacity of 4,100 persons, making it one of the largest convention halls in the state.

8561 AUTOMATIC FOUNTAIN SERVES SELF-MIXED DRINKS

Similar in character to the automatic cafeteria where food is dispensed in return for a coin dropped in a slot, is a new automatic sanitary fountain that dispenses drinks in the same way. But it also does a great deal more than that, for it mixes its own drinks, measures them, cools them, and delivers a paper cup with each drink by means of a cup-dispensing system that is said to be entirely novel in design. The fountain has its own electrically operated refrigerating apparatus, and also a filter which purifies the water before it is used in mixing the drinks. It serves three customers at a time, measures and mixes each drink in 12 seconds, and has a capacity of 500 drinks per hour by actual test. All the syrup tanks are porcelain-lined, and the entire dispensing mechanism is silver-plated.

That the ancient Inca Indians had a knowledge of brass is shown by the analysis of an ax head composed of a mixture of copper and zinc.



Automatic, Sanitary, Nickel-in-the-Slot Fountain That Mixes Cold Drinks and Serves Them to Three Customers at a Time: Its Own Refrigerating Apparatus can be Seen Below

Mr. Paul Marwurm Copyright material
mfr. Marwurm magic donut Co. Sheldon Chicago

2416

44 *Illustrated*

POPULAR MECHANICS

PHOTOGRAPHER IN BOAT SNAPS DISTORTED REFLECTIONS

Photographic studies of water images have been made in the past, usually with the aim of portraying the reflection as an inverted but faithful duplication of the object. The very opposite, however, was the end of experiments carried out recently by one photographer. In every case he attempted to catch the reflection at its instant of greatest distortion. This he

camera at the diverging ripples of the wake he secured pictures of undulating docks, oscillating factory chimneys, and other irregularities often seen but seldom recorded for their own sake.

8192

REMOVE OXYGEN FROM WATER TO PREVENT PIPE RUSTING

In western Australia it is necessary to pump water great distances, and it was found that the formation of rust inside the pipe

caused a serious loss in the pumping efficiency. It was suggested that the oxygen dissolved in the water might be the cause of the rapid formation of rust, and the experiment was tried of passing the water through a tower in which a vacuum was maintained. It was found that 90 per cent of the dissolved oxygen could be removed in this manner, and the formation of rust in the pipe was practically stopped, as the remaining oxygen was absorbed in the first

30 miles of pipe. Tests of the water at the end of the pipe showed no oxygen.

8193

EQUIP NEW MAIL TERMINAL TO HANDLE BIG TONNAGE

In the construction of the railway-mail terminal at Chicago, much attention has been given the mechanical equipment which will be necessary to transfer and handle the large tonnage of mail matter which will pass through it daily. The terminal will be capable of handling 3,000 tons of mail each 24 hours, and as one part of its equipment, will have 15 freight elevators. The belt-conveyor equipment is one of the features of the installation, as there will be 65 of these, using a total of seven miles of belting of different widths from 30 to 48 in. They will play an important part in the sorting and transfer of mail sacks and packages. The transfer conveyors on the upper floors will be placed near the ceiling and deliver the mail to spiral chutes leading to the delivery belts on the first floor. This method of placing the belts takes advantage of all the space available and leaves the floor clear for the use of trucks.



COPYRIGHT, L. S. BLAINE
Photograph Taken from a Boat When the Water was Disturbed by Ripples:
If the Upper Half of the Picture were Covered, It would Be
Difficult for a Person to Guess What It Showed

did by standing in the stern of a boat which he allowed to drift parallel with and close to the shore. Pointing his



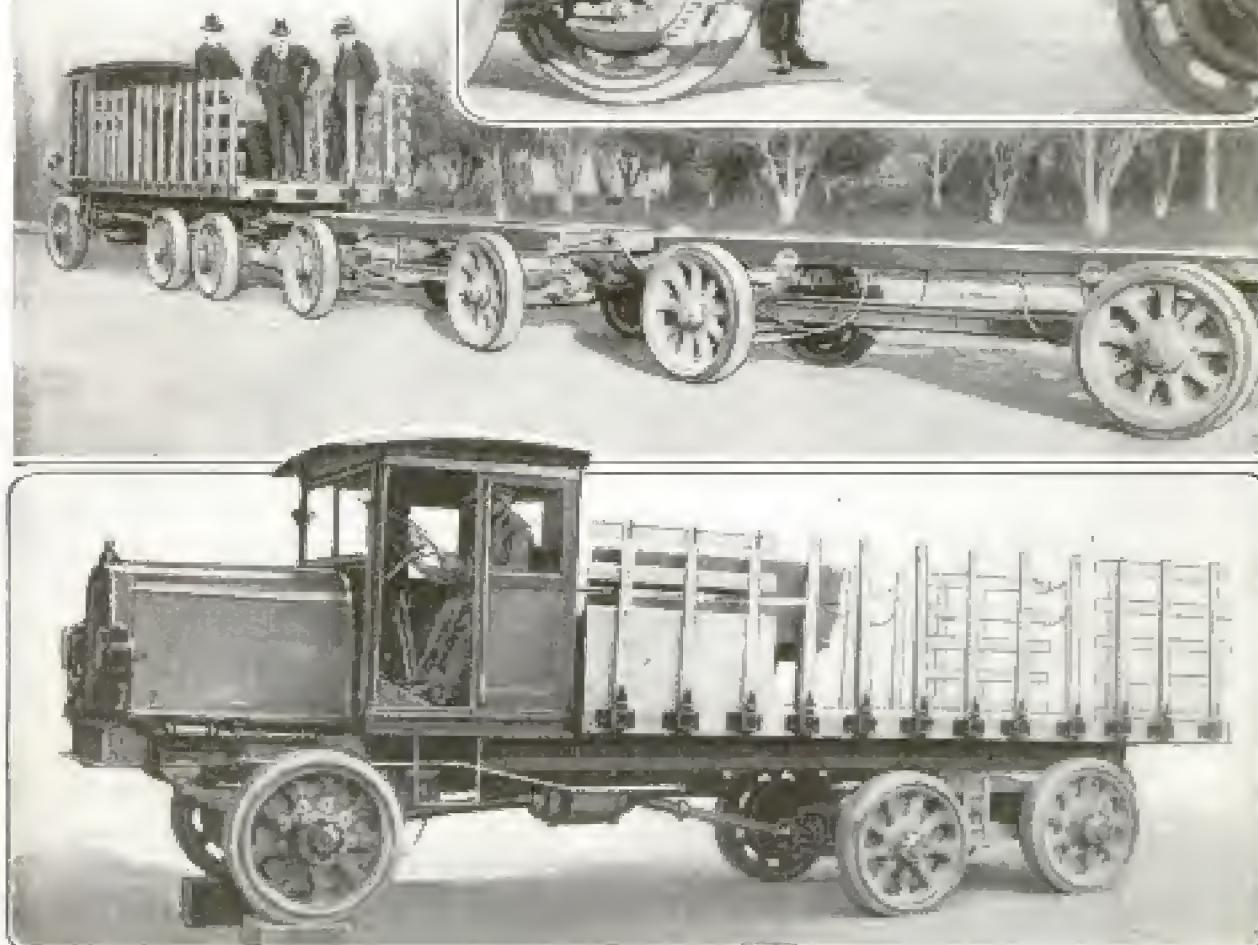
COPYRIGHT, L. S. BLAINE
The Reflection of the Chimney in the Water Makes It
Appear as though It were Falling in a
Most Peculiar Manner

Railway Age 3/4 page
Copyright 1916 by Popular

ELECTRIC TORCH SUCCESSFUL IN UNDERWATER CUTTING

When a 36-in. cast-iron water-supply pipe was broken recently in New York harbor, a difficult task was presented in the removal of the broken piece. It was decided to try to cut the pipe

Right: The Highway Train is Coupled Together Much like a Railroad Train, and Air for the Trolley Brakes is Supplied from the Truck through Pipes and Flexible Connections. Center: The Highway Train on a Road Test; the Trailers are So Designed That Their Wheels Follow in the Track of the Truck. Below: The Truck Which Furnishes the Power Drives on All Six Wheels.

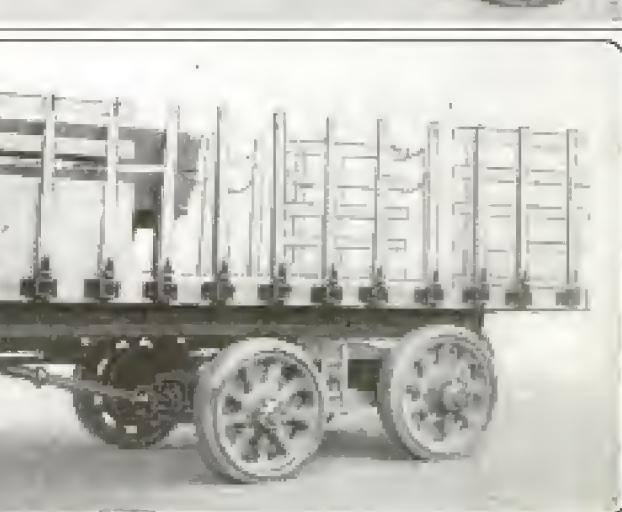


with an electric torch specially designed for underwater cutting. Submarine cutting of steel plates has been done before, but this was the first time that this system was used in cutting cast iron. At the point where the break occurred, the water was 50 ft. deep. Divers were sent down, and the electric torch proved effective, the pipe being cut away in much shorter time than would have been possible with any other known method.

American Highway Transportation Co. 8529 San Francisco, Calif.

NEW SIX-WHEEL-DRIVE TRUCK PULLS HIGHWAY TRAIN

One of the latest developments in highway freight transportation is the six-wheel-drive auto truck capable of carrying a 10-ton load and pulling two five-ton



trailers. The truck drives on all six wheels and steers with the two front and two rear wheels. Each wheel of the truck and trailers is equipped with a special hydraulic-pneumatic brake, the brakes on the trailers being arranged to set automatically should the trailer break loose from the train. The trailers are designed so that their wheels will follow in the track of the truck, and are equipped with special antiwobbling devices.

The Columbus Auto Club, ~~Hastie Electric Water Heater Co.,~~
Columbus, Ohio. ~~Nottingham~~

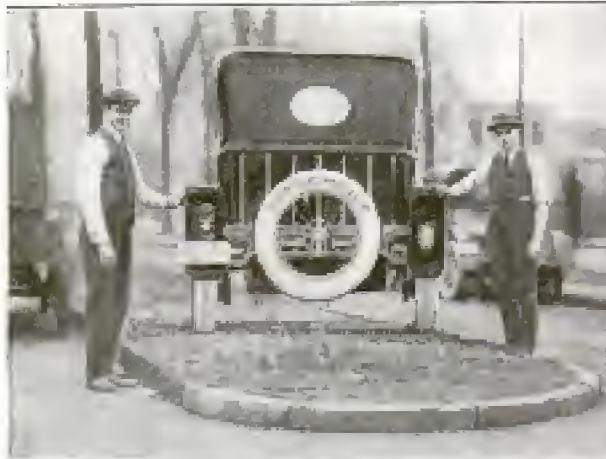
746

8593

POPULAR MECHANICS

DANGER SIGN AT BAD CORNER SIMULATES REAL AUTO

Wishing to call the attention of motorists to the curbing at a dangerous street corner, the Columbus, Ohio, Automobile



What Looks like an Automobile Which has Run Up on the Curb Is in Reality a Warning Sign Erected as a Danger Signal for Motorists Turning the Corner

Club erected a warning sign which was formed like the rear of an automobile. A reflecting danger signal was placed in the center of the "spare wheel," which made the sign efficient at night and much more noticeable than the ordinary warning sign.

REFUSE CONVEYED BY SUCTION IN 700-FOOT PIPE LINE

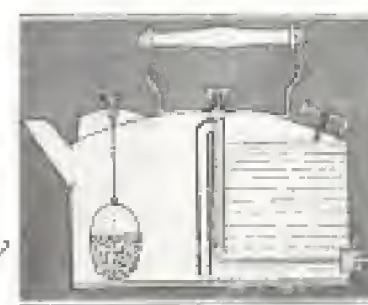
When recently a lumber company in Ohio built an addition to its plant, situated at a distance of 700 ft., there arose the problem of how to handle the saw-

dust and refuse of both plants efficiently as a unit. The difficulty was overcome by connecting the two plants with a 15-in. pipe line. In connection with this is an air pump which conveys by suction the sawdust and refuse from each plant along the pipe line to a spout that is about 25 ft. above the roof of one of the plants. At this point there is erected on the roof a tank into which, in this way, the refuse is discharged. The tank has a hopper bottom with a discharge pipe leading from it to a point just above a side track for box cars. By this means it is loaded into the cars for shipment. The lumber company thus avoided a threatened increase in its insurance rate of from 20 to 25 per cent, and at the same time does the work more efficiently.

8537

NEW ELECTRIC TEAKETTLE HAS TWO COMPARTMENTS

An electric teakettle has lately been devised which is divided into two compartments. In one compartment an electric element heats the water until it boils; then, by pressing a button at the center of the top, a valve is opened and



the steam pressure is made to force the boiling water into the compartment where the tea ball is hung.



Two Views of a Pipe Line Connecting Two Branches of a Lumber Plant, 700 Feet Apart, That Conveys by Suction the Sawdust and Refuse from Each Branch to the Tank above the Roof of One of Them

Encl. R. Tickner
39-47 Leonard Ave. Cincinnati

8527 Comb Jno. R. Drougher,
Texas City Texas.



The Wrecked Concrete Tanker "Selma" Tied Up at a Galveston Wharf, after having been Raised by Means of Compressed Air: The Bracing of the Forward Deck Was to Strengthen It So as to Resist the Air Pressure. The Vessel Sank upon the Mud beside the Wharf, and Remained There Nearly a Year

CONCRETE SHIP BURIED TO SAVE EXPENSE

THE use of reinforced concrete as material for building ships was dealt a severe blow recently when the Shipping Board towed the concrete tanker "Selma" from the wharves at Galveston, and literally buried it at considerable expense, to get rid of it and stop wharfage charges.

The vessel, which is reported to have cost nearly \$2,000,000, ran into the rock jetties at Tampico, Mexico, about a year ago, and ripped a big hole in the bottom of the hull. The tanker was raised with compressed air and towed to Galveston. There, shipbuilders decided that it would not be practicable to repair the damage. The rods which reinforced the concrete were projecting through the hull, and it would have been difficult to get the craft in position upon the drydock for repair. So the "Selma" was allowed to sink upon the mud at a wharf where it lay for nearly a year, and wharfage charges of about \$1,500 a month piled up.

The task of getting rid of a steamship, especially one with a big hole in its hull and ready to sink in the nearest deep water, seems simple at first sight. However, the Shipping Board had considerable difficulty in disposing of the "Selma." It was first offered for sale, and nobody wanted it. Then it was proposed that it be towed out and beached near the Galveston jetties, for use as a fishing pier.

The Federal engineering department objected on the ground that the hulk might set in motion currents which would undermine the jetties. The proposal of taking the ship to sea, and allowing it to sink, was abandoned because it was feared that it would sink before it could be towed far enough not to become a menace to navigation.

The ship drew about 24 ft. of water when lifted as high as it was possible, and for that reason the only spots along that section of the coast that it could reach were considered to be navigable waters which must not be obstructed. The gulf is so shallow around Galveston that the vessel could not be brought within a mile of the beach.

The problem was solved by dredging a channel from the deep water of the government channel into Galveston and out into the sand flats at one side of it. This channel was cut 30 ft. deep for 400 ft.; the "Selma" was raised by compressed air, run into this channel, and allowed to settle to the bottom. Its decks and upper works are still above water, and are expected to remain there for a long time. But the currents will soon refill the channel, and the tanker will be lying in sand with only a few feet of water around it. If the vessel is ever desired for use again, it will be necessary to dig it out.

Mass.

It has been suggested that the hulk be used for a shrimp-canning factory, but no definite steps along this line have been taken. All movable machinery was salvaged, but the major portion of the machines on the "Selma" were bedded in the concrete of which it is constructed, and it will be necessary to break the ship up to take out these machines.

POWER COMPANY'S CUSTOMERS READ METER IN CONTEST

During a meter-reading contest conducted for the benefit of its customers, a Harrisburg, Pa., power company discov-



Display Window of Power Company, Showing the Watt-hour Meter Placed in a Framed and Velvet-Lined Box

ered an amazing lack of understanding relative to the correct reading of the instrument. The meter was placed in a display window of the concern, and cards furnished to those desiring to enter daily records of their conception of the amounts shown on the dials. These cards, together with similar ones marked by regular meter readers employed by the firm, were handed in to clerks who checked and filed them. At the conclusion of the 12-day period, when the several prizes for the best average cards were to be distributed, it was found that but one of the many participants possessed a perfect score.

USE OF SECONDARY CONDENSER IMPROVES AUTO IGNITION

New principles of condenser construction in connection with a high-tension magneto-ignition system for auto engines have been discovered by an experienced engine builder of Detroit. This new con-

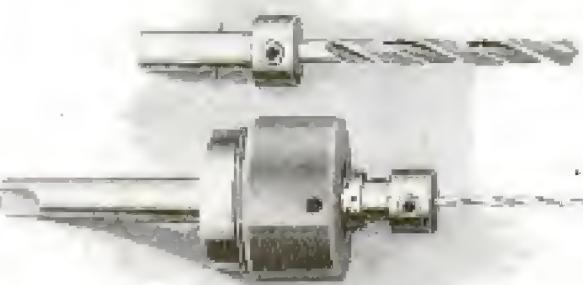
denser, made of glass, is absolutely sealed from brush-discharge loss, and is practically indestructible, for it takes 60,000 volts to puncture it. Another departure from the common practice in condenser construction is the use of very thin steel plates in connection with the glass-tube dielectric. After the steel plates are electrically connected, the glass tube is incased in a mahogany box, and the condenser is sealed by pouring over it a cement that has been made specially for this work. It is poured in at a temperature of 250° F., which removes all traces of moisture in the condenser, and eliminates brush-discharge losses. It is used as a high-tension secondary condenser in the high-tension circuit of the ignition system.

8499 ^{Virt} Decalator Price \$6.00

SAFETY DRILL AND TAP CHUCK

SAVES TOOLS FROM DAMAGE

A friction-drive positive-safety drill and tap chuck, recently patented, has a soft-steel pin which drives the collet, in which the drill or tool is held, and shears off when the cutting tool is overloaded. The collet slips into the chuck when the sleeve is raised, and is held rigid when the sleeve is lowered. In the small end of the collet is an ejector. A light blow on this releases the drill or tool. A hollow screw in the collet prevents the tool from being pulled out or pushed in, and end play of the collet is impossible. As a result of this construction it is impossible to break or burn drills or other tools held

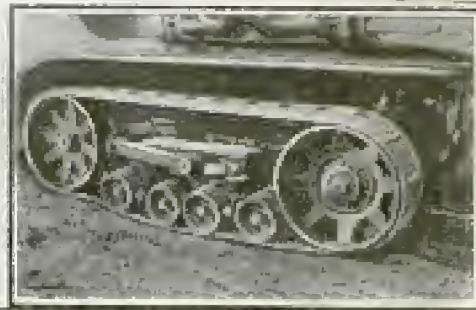


Friction-Drive Positive-Safety Drill and Tap Chuck Are Below. Above, the Collet is Removed, Showing the Soft-Steel Safety Pin That Drives It

in the collet. The tools can be made of carbon steel, and the cost of high-speed steel is, therefore, avoided.

Recent radiotelephone broadcasting by the New York Western Electric Station, using a limited wave length, was heard by a vessel 1,000 miles west of San Francisco.

8509

International Newsreel Corp
no. 90, 4 Rue Richer,POPULAR MECHANICS Paris 740
(Type)

AUTOMOBILE FITTED WITH TRACTOR TREAD FOR TRAVEL OVER SNOW

TRIALS of devices to fit automobiles for travel over snow-covered roads were recently held in France. One of the competitors fitted a tractor tread to his car, consisting of two wheels over which a rubber belt traveled. Four small intermediate wheels helped support the weight of the car and give the belt traction on the snow.

7133

WAR DEPARTMENT SUPPLIES BEDS TO FOREST SERVICE

One of the valuable pieces of work being done by the salvage office of the War Department is providing a supply of beds for the warmth and comfort of forest rangers and volunteers during rests in fighting forest fires. These emergencies require the services of every available man in the region for a task which is extremely taxing. It is essential that during the short periods of rest which are possible, each should have an opportunity to sleep in warmth and comfort. Bed rolls, containing three woolen army blankets and two shelter halves, are now supplied to the fire fighters. The shelter halves form a regular army shelter tent.

The blankets are washed and disinfected at frequent intervals. One bed is apportioned to two men in the summer, while in cold weather each ranger is supplied with a separate unit, and they are carried from one locality to another on mules.



A Pile of Bed Rolls at the Denver, Colorado, Headquarters of the Forest Service, Where 500 Units are being Put in Readiness for Distribution to Camps in the National Forests of Colorado, Wyoming, and South Dakota

Cml. S.A. Winters 702 District
National Frank Blodg. Washington, D.C.

ent. Maurice E. Pelgrims
35 Place de la Bourse

750

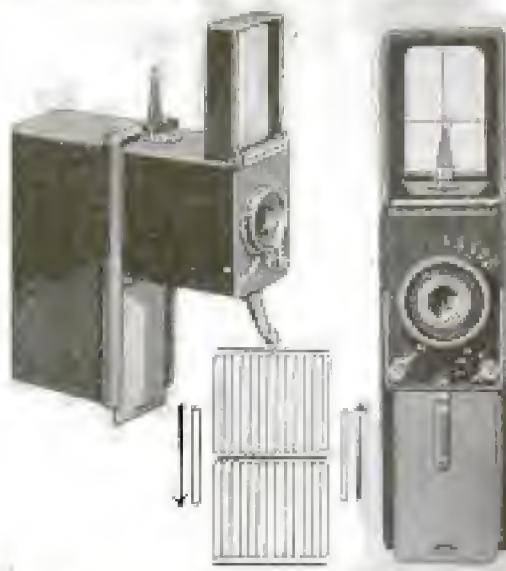
POPULAR MECHANICS

Antwerp Belgium

TINY FRENCH PLATE CAMERA

IS BUILT LIKE A PISTOL

A small camera, which might almost be called a watch-charm design, has been introduced by a French firm. In general

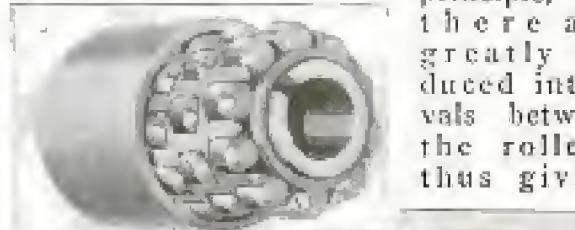


This Extra-Small Plate Camera is Sighted and Snapped like a Pistol. The Diagram Shows the Method of Shifting Exposed Plates in Holder Magazine.

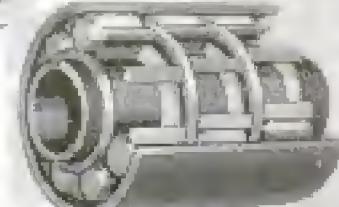
appearance it resembles a pistol, and it is pointed and snapped in a similar manner. It carries 48 plates in two compartments, and has an indicator which tells the number exposed. When closed, the range finder folds over to form a protection for the face of the camera, and the trigger snaps up to hold the finder securely. The pictures taken are about $\frac{3}{4}$ by $1\frac{1}{8}$ inch.

STAGGERED ROLLER BEARINGS FOR HEAVY-DUTY SERVICE

Heavy-duty roller bearings are now being made which embody a valuable principle, for there are greatly reduced intervals between the rollers, thus giving



Above: Heavy-Duty Roller Bearing with Outer Race Removed to Show Staggered Rollers. Right: View with Some Rollers Removed to Show Space Rings



a much more continuous radial bearing. This is accomplished by cutting the rollers in sections, spacing them in series longitudinally, and staggering these series with relation to each other. The rollers are mounted in a cage with suitable clearance, and means for retaining them in their staggered positions. Adjustable space rings are mounted on the inner race so as to take care of all end thrust, and also to prevent friction between the ends of the rollers. In general, the inner and outer races are similar to those of conventional bearings.

BRICK PAVING SERVES WELL

8598 DURING LONG PERIOD

The first use of building brick for street paving was in Charleston, W. Va., in 1871, and the pavement gave good service for 38 years. Another brick pavement in the same city has been down for 27 years and is still in good condition. One of the first bricks laid in the older pavement has been preserved; it shows a wear of less than one inch during its 38 years of service. Eng News-Record

8499 SIMPLE GAUGE TO MEASURE OVERSIZE IN CYLINDERS

For measuring with precision oversizes in cylinders or pistons, a gage, much simpler and more easily read than the



Micro Gauge for Measuring Oversize in Cylinders, Shown with One Blade of a Thickness Gauge between the Pins: Insert Shows the Gauge in Use in a Cylinder

ordinary micrometer, is now on the market. Its pronged arms carry pins, one fixed and the other adjustable, the combined length of which, when together, equals the nominal diameter of the cylinder to be measured. Therefore, any opening between the two pins shows the oversize of the cylinder. This opening is measured with a thickness gage, of which several are provided, each stamped with its thickness in thousandths of an inch.

Universal Roller Bearing Corp.
Norfolk, Va.

Stevens & Co
275 Broadway
New York

864

THE GREAT AMERICAN DOG-TEAM DERBY



Start of the Great American Dog Derby. Held at Ashton, Idaho, February 22, as the First Big Event of the Yellowstone Golden-Anniversary Year: Governor Davis, of Idaho, Was the Official Starter. The Dog Team Shown in the Picture was Driven in the Race by the Only Woman Competitor, Miss Lydia Hutchison. She is Standing beside the Sled, and Evidently Matches Up with Any of Her Male Rivals—in Size, Strength, and Nerve, Not to Mention Clothes. On Her Back Are Two Numbers, One for Herself and the Other Representing "Snoopy Gaston," the Famous Dog-Team Driver Who was Last a Day before the Race.



Finish of the Dog Derby, with the Winner, Tud Kent. Shown Dashing across the Line: The Race was Run in a Blinding Blizzard, Which Fortunately Moderated before the Finish. Besides a Valuable Purse, the First Prize Consisted of the Silver Championship Cup.

POPULAR MECHANICS

INHABITANTS OF BORNEO EAT
FLESH OF CROCODILES

879
Crocodile meat is considered a delicacy by the natives of Borneo, and when one



COPYRIGHT, PAPER ILLUSTRATING SERVICE
Slain Crocodile Surrounded by Group of Borneo Natives Who Consider the Flesh of the Monster a Delicacy, and Permit the Executioner to Carve Out the Liver for His Reward.

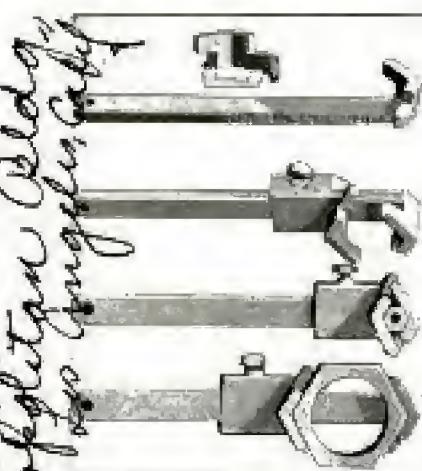
of the reptiles is slain, there ensues a mad scramble for its flesh, and feasts for those who obtain portions of the carcass. The liver has a flavor which makes it especially desirable to the queer people. It usually is allotted to the man who took the most important part in the slaying of the monster.

488
SOCKET WRENCH ADJUSTABLE
FOR VARIOUS-SIZED NUTS

Adjustable for use on from $\frac{1}{4}$ to 4-in. nuts, a newly invented

socket wrench consists of a shank with a V-shaped jaw at one end and at right angles to it. On the shank slides a similar V-shaped jaw, with the "V" reversed, that can be held with a setscrew in any adjusted position. Thus the two jaws

are made to grasp hexagon nuts of any size, and the tool can be used as a socket wrench wherever there is nothing to interfere with the radial movement of the shank when turning the nut.



8078
BLUEBERRY EXPERIMENTS GIVE
REMARKABLE RESULTS

Unlike most plants, blueberries thrive only in acid soil and their propagation offers an opportunity for utilizing land otherwise unfit for agriculture or, at best, requiring expensive treatment. For this reason, the Department of Agriculture has been conducting experiments, for the past 10 years, to develop a superior type of berry for cultivation. Most of the work has been done at Whitesbog, N. J., where the combination of sand and peat soil affords ideal experimental conditions. It has been highly successful and hybrids have been developed which are the size of Concord grapes, and in some cases even $\frac{3}{4}$ to $\frac{5}{8}$ in. in diameter, though the wild berries are only about the size of peas. They have also been selected for flavor, juiciness, and firmness. As yet the giant berries have not become available in sufficient quantities for acre planting, though a number of irresponsible dealers have



Left: Twig of Blueberry Bush with Berries of Ordinary Size. Right: Twig of the Same Bush Whose Flowers were Pollinated from Another Bush.

858
sold plants, by misleading statements, which have proved a disappointment.

TO STUDY STANDARDIZATION
OF BUILDING MATERIAL.

As a means of eliminating waste in industry, it is proposed to study the problem of standardization as applied to building materials, with a view of simplifying the types and reducing the number of different sizes of various materials. Items mentioned for study include millwork, plumbing, heating, hardware, and clay products.

8560
The World
2/1/22

POPULAR MECHANICS

433

RECORD VIOLENT EARTHQUAKE UNDER PACIFIC OCEAN

On January 31, the seismographs all over the country recorded an unusually violent earthquake which was calculated to be at the bottom of the Pacific Ocean, off the coast of Washington or Oregon. At some of the stations the instruments registered more violent disturbances than at the time of the California earthquake of 1906. The disturbance lasted for a little more than three hours, according to the record. It is worthy of note that the San Andreas fault, along which the 1906 earthquake occurred, disappears in a northwesterly direction in the Pacific.

7434

COMBINED TRAILER AND CRANE HANDLES DISABLED AUTOS

One would hardly expect a practical invention to come from circus clowns, but it is two clowns that have invented a combined auto trailer and crane for handling disabled machines, which promises to prove highly useful. A hinged platform is so mounted on the trailer that a machine may be run onto it. Then, by means of a windlass, the platform is tilted up so that the underside of the car is accessible for repairs. If the car must be taken to a garage, the trailer is hooked to a truck and the whole outfit towed away. A crane attachment, also operated by the windlass crank, can be used to lift the engine out of the machine.



Right: Automobile Trailer being Used to Haul a Disabled Car to the Garage for Extensive Repairs. Above: Elevator or Crane Feature of the Trailer for Making Slight Repairs While on the Road.

Wilson & Heisler Co
1004 Treat Ave,

8437 San Francisco
CONSTRUCT RADIOTELEPHONE
IN FORM OF PHONOGRAPH

433

Calif.

At last the radio phonograph has made its appearance. A complete radio receiver, with all controls, is combined in one unit and set in a neat case resembling the present-day phonograph. Two suitable connecting



After Connecting to the Aerial and Ground Wire, the Radio Phonograph is Tuned In by Adjusting the Control Disk

posts are provided for connecting to aerial and ground, the only exterior devices necessary for operating. In the lower part of the cabinet is a storage battery which furnishes power for filaments of the audion bulbs. A rectifier and hydrometer test set are also provided for recharging and testing, so that no detail in the care of the battery is left out. Due to the fact that radio music is now broadcast at all times, it is only necessary to connect aerial and ground and then tune in and enjoy a concert.

If The Bureau of Mines is soon to undertake the study of the problem of the preparation of such alloys as that of 50 per cent copper and 50 per cent lead.



A. E. Leake Erecting Co., Bridgeport,
Conn.

Germania. Aeroglobe. Military

8640
754

POPULAR MECHANICS



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LAST RITES FOR THE VICTIMS OF THE "ROMA" DISASTER

WHEN the airship "Roma" crashed to the ground, 34 persons were carried to their death. Because many of the bodies had been shipped for burial to homes in distant parts of the country, one body was selected to represent all of the victims. Full honors were accorded this body, and all business activity ceased as the funeral cortège moved from the church to the Casino Grounds, at Newport News, Virginia.

DETECTION OF FORGERIES BY MICROPHOTOGRAPHY

With the help of the microscope and microphotography, it has been possible by means of an exact examination of the ink, and otherwise, to distinguish forged writings from the authentic. But in the case of changes of figures or words in old handwriting by superimposing new pen strokes, it has always been difficult to determine which of the pen strokes preceded the other, and thus to decide positively which was the genuine and which

was the falsification. In doing this by means of microphotography, it has been customary to place the object photographed at right angles to the camera, with results that are not satisfactory. A Frenchman, very well known for his remarkable work in criminal detection, has proved that if the document be placed so that the writing is viewed horizontally, the results are very much more satisfactory than when the document is held at right angles to the camera. His method shows clearly which of two pen strokes, one above the other, was made last.



French Microphotographic Apparatus for Detecting Forgeries: At Left is Shown a Photograph, Taken in the Old Way, of a Figure "1" That was Later Changed to a "4," Which Shows the Horizontal Stroke Apparently below, Whereas It Was Actually above, the "1," as Shown Clearly in the Photograph to the Right, Which was Taken by the New Method.

encl. E. H. Weiss, 80 Boul. Jourdan
Paris (X^e) France.

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STANDARDIZING DISHES TO AVOID BREAKAGE

By C. H. DACY

*National Press Club
Washington, D. C.*

THE dish-juggling and glassware-smashing stunts of "slapstick" comedy are being tried out at the Bureau of Standards laboratories, where dish and glassware-durability tests are now in progress, in order to obtain definite data for the formulation of crockery and glassware specifications which it is expected will be widely adopted. A most novel tumbler tester has been devised which subjects glasses of all classes and types to service wear and rough handling such as they would be exposed to in active use. This glass-tumbler destroyer consists of a holder in which the different glasses are placed with the bottom side exposed. An iron ball is suspended on a metal rod like a pendulum so that it can be withdrawn different distances and then released and allowed to ram into the bottom of the tumblers. All tumblers which will withstand the impact of a full-swing blow are qualified as satisfactory. The force of the blow delivered in this manner is equivalent to dropping the tumblers from an elevation of four feet upon a concrete floor.

Heretofore, the U. S. Army has been accustomed to purchase hand-made tumblers for use at barracks and messes in all parts of the country. The experts at the Bureau of Standards have ascertained by their extraordi-

nary tests that the machine-made tumblers which cost 50 per cent less, are just as durable and satisfactory for army use

as the more costly glasses previously used. As a result of the investigations now under way, new specifications for army glassware are being drawn up. In addition to the direct jarring tests, many other practical and simple methods of exposing glass and dishware to rapid and effective service tests are followed in these investigations. The crockery is exposed to extremes of heat

and cold similar to the conditions which obtain where automatic dishwashing machines are used. Study is being made of the cobwebs of cracks which occasionally develop in poorly made chinaware, to ascertain the cause and cure for these defects. Glassware is also subjected to

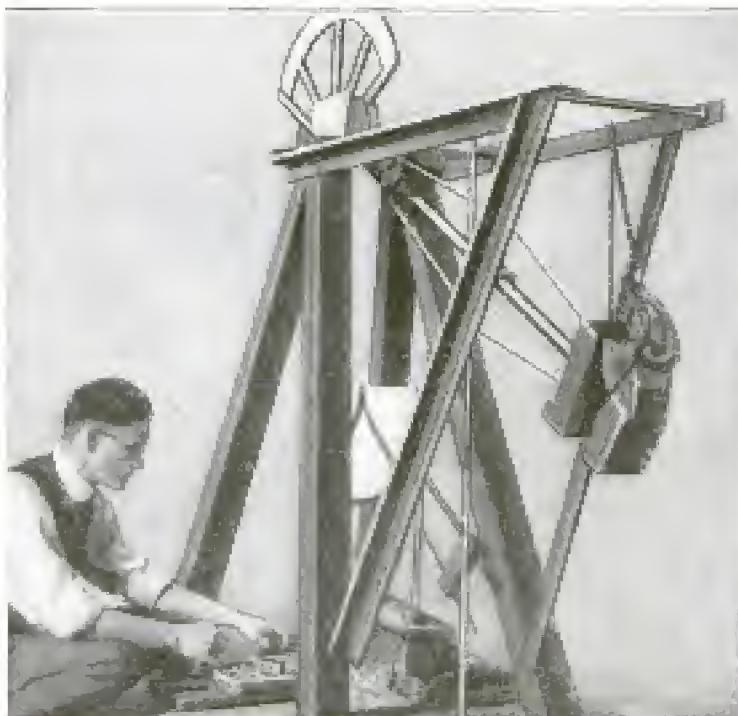
boiling tests in order to determine its suitability to withstand regular and routine sterilization after use.

In addition, strength tests are being conducted relative to the durability and adaptability of different kinds of plate and window glass to various kinds of service. Approximately 5,000 samples of different kinds of plate glass have broken in various strength tests.

As a consequence of these experiments, it is anticipated that shortly the American Institute of Architects will draw up and



Pendulum Hammer Which is Used to Break Plates Whose Durability is Measured by the Length of the Arc through Which the Pendulum Swings



Pendulum Hammer Used to Determine the Breaking Point of Plate Glass, Which is Placed in the Path of the Hammer Whose Swing is Increased Until the Glass Breaks

follow new specifications for plate and window glass. Detailed tests are also being performed with porcelain and enamel-



Glasses Which have been Subjected to a Boiling Test of Six to Twelve Hours for the Upper Two, and for the Lower Pair, Which Is of Inferior Quality, of Five to Twelve Hours

ware in order to find out the exact serviceability and durability of these household articles. The fact that the annual dish-breakage bill in a leading Chicago hotel amounts to more than \$50,000, while other prominent hosteries report that their yearly breakages aggregate about 20 per cent of their total supplies, indicates the importance of studying and standardizing glass and dishware and of making these articles stronger and of better materials, so that they will be able to

withstand severe usage longer and more satisfactorily.

Attempts will be made as a result of these investigations to standardize the sizes of plates used and to grade, classify, and mark crockery accurately so that there will be fewer errors made in its manufacture. The Bureau of Standards is urging the potters and dishware factories to adopt uniform specifications and, as far as possible, to eliminate unpopular styles and sizes of crockery and tumblers. The tests show that American-made dishware and glassware, such as used in the best hotels, are more durable and serviceable than the best of the European dishes. Our hotel china is the best material of its kind on the market.

9575

PACIFIC COAST OF GUATEMALA TO HAVE BANANA INDUSTRY

For the first time bananas are to be grown on the Pacific coast of Guatemala on a commercial scale. An American corporation, licensed to do business in that country, has acquired a plantation 15 miles west of San José de Guatemala, where it is expected soon to have 2,000 acres planted with bananas. Although the banana industry has reached large development on the Caribbean coast, it has hitherto not been attempted on the Pacific coast, because of a lack of rainfall and transportation facilities. The American corporation intends to employ irrigation, and has completed arrangements for the transportation of the fruit to western ports in the United States.

N.Y. Times 2/28/22 P. 2

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.



Left: Scale Test for Determining the Durability of Plate Glass. Shot are Loaded into the Pail Until the Glass Breaks under the Weight. Right: Light Pendulum Hammer being Used to Test the Strength and Resistance of Various Kinds of Plate Glass

WOODEN CANAL AQUEDUCT REPLACED WITH STEEL

At the Right can be Seen the Aqueduct over the Fox River as It Appeared during the Winter Months, with Hanging Icicles Caused by the Water Leaking through the Floors. The Bottom Picture Shows the Leaky Condition of the Floor in the Summer, Thus Plainly Indicating That the Old Structure Was in Great Need of Repairs.



At the Lower Left is Shown the Aqueduct with a Temporary Flume Built in It for Carrying Water during the Late Winter So That Ice Companies could Obtain Their Annual Harvest. At the Lower Right is Illustrated the Condition of the Old Floor When the Water was Allowed to Run Out So That Repairs could be Made.



Over the Fox River at Ottawa, Ill., is a large aqueduct which carries the waters of the Hennepin Canal, and which contains eight 57-ft. spans. The original aqueduct was constructed of wood and has had to be repaired very often because of the rapid deterioration of the water-soaked lumber. Last summer the duct was leaking to such an extent that the state proceeded to undertake extensive repairs, but when the water was allowed to run out, the workmen found the entire

structure so weak that it was in danger of collapse at any moment. Consequently bids were solicited for the replacing of the old wooden channel with one of steel, which resulted in the acceptance of a bid for the sum of \$80,000. The work of dismantling has been started, and the building of the new duct is expected to be completed in a short time. Repairs to several of the lock gates will also be necessary before the canal is again ready for use as a waterway.

8083

RUBBER RETAINER EMPLOYED ON FLUE-BEADING TOOL

Boiler flues are headed to insure a tight fit in the fire box, and an Illinois man has produced a rubber retaining ring, to be placed on the tool used in accomplishing this work, which has been found to be a decided improvement. In operation with an air hammer, there is no possibility of the workman accidentally "shooting" the

beader, or chisel, far into the flue, if the retainer has been previously fitted on it, and the rubber is an aid in turning the tool when it has become heated.



Flue-Beading Tool, Showing the Rubber Retaining Ring Which Prevents the Tool from Going into the Flue

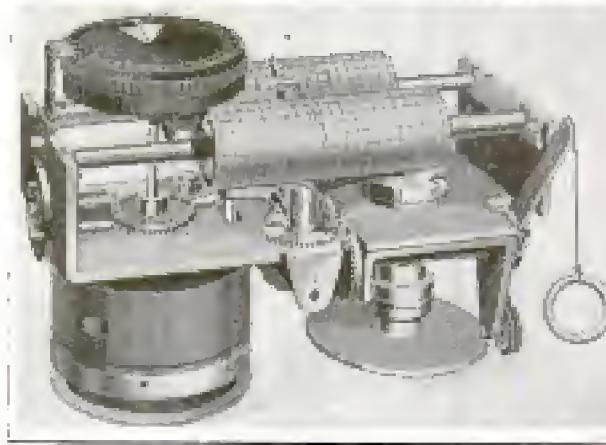
*Mr. Carl Bush, 3108 Marshall Ave.,
Ottawa, Ill.*

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Cont. Maurice E. Pelgrims Cont. Cyril E. hand
 35 Place de la Lége 309 Ballard St.
 758 Antwerp Belgium Ypsilanti,
 POPULAR MÉCHANICS Mich

845⁵ PRELIMINARY SURVEYS EASY
WITH NEW FRENCH DEVICE

An instrument of French design reduces the work of making preliminary



This Portable Instrument for Preliminary Surveys, When Carried by the Surveyor, Records on the Drums the Direction and Elevations of the Course Traveled

surveys quite materially, for it records automatically on two drums the elevation and bearing of the ground covered. In operation, the assistant carries the measuring wire ahead; the surveyor then adjusts the compass to give the direction, and walks toward the assistant. A spring rewinds the wire, and in doing so causes the two drums to revolve, recording the elevations and direction for the distance traveled.

LUMBER-TRUCK RATCHET CRANK
FACILITATES UNLOADING

In the ordinary method of loading and unloading lumber by platform rollers on motor trucks, the load is moved backward till it reaches the tipping point, and before the motor truck can be driven for-

ward to draw it from under the load, the crank handle on the roller shaft must be taken off. This is not necessary with a new safety reversible ratchet crank, which can be left on the shaft, and be held in the hand, on account of the action of the ratchet, while the rollers turn rapidly under the falling lumber. This saves time, and prevents any danger of accident from a crank spinning in the air, because of neglect to take it off the shaft at the proper time.

845⁵

SHOW PROGRESS OF BUILDING
WITH GRAPHIC SIGNBOARD

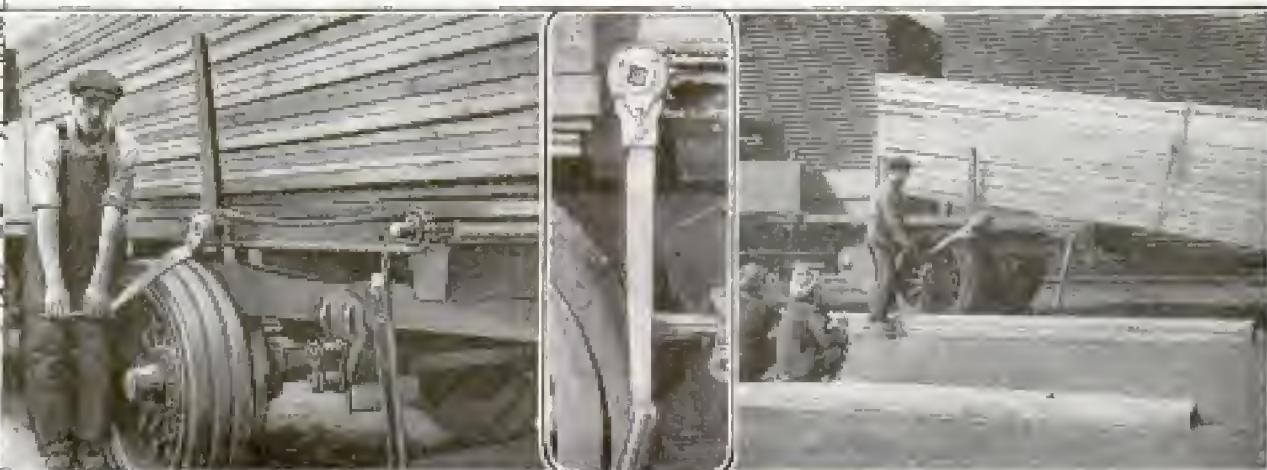
Considerable attention was attracted by a graphic signboard erected on a construction job recently. The board was erected as soon as wrecking operations started on the old building, and as the



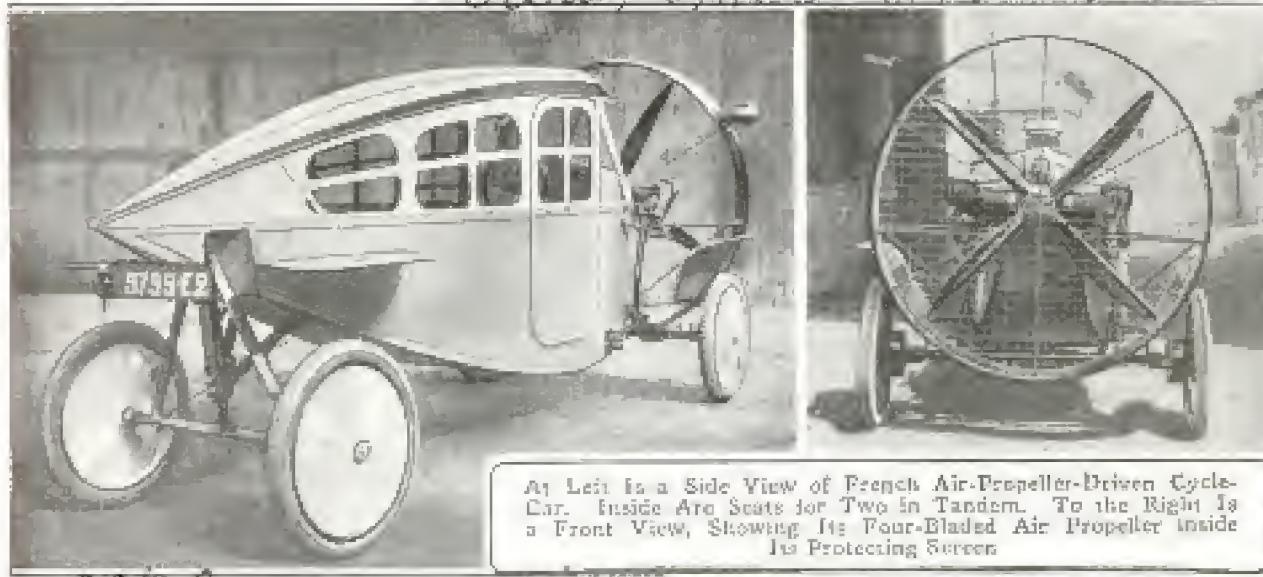
The Graphic Signboard Shows That Four Operations are Completed and the "Final Touches" Just Started

different operations progressed, the white spaces were gradually filled in with red, showing the stage of completion of the various portions of the work.

Blind pedestrians at Denver, Colo., are to be furnished with traffic whistles, by blowing which they may call the traffic officer's attention to their desire of crossing a street.



Left: Safety Ratchet Crank being Used on Truckload of Lumber. Center: Close-Up of Safety Ratchet Crank in Place. Right: Operator Seen Holding the Crank While the Lumber is being Unloaded from the Truck. This is Made Possible by the Use of the Ratchet in Connection with the Crank.



At Left Is a Side View of French Air-Propeller-Driven Cycle-Car. Inside Are Seats for Two in Tandem. To the Right Is a Front View, Showing Its Four-Bladed Air Propeller Inside Its Protecting Screen.

8379
**PROPELLER-DRIVEN CYCLECAR
 BUILT IN AIRPLANE STYLE**

A novel cyclecar, designed on the lines of an airplane, including its means of propulsion by a large propeller mounted in front of the car, has recently been built in France. It is a four-wheeled car, with the propeller directly in front of the forward wheels, and inclosed in a light circular frame that carries a wire netting as a protection to the propeller. This is direct-connected to an air-cooled rotary engine of the radial-cylinder type. The propeller is either four or six-bladed, the former where high speed is desired, and the latter where high efficiency is preferable to speed. In the body of the car are two seats in tandem. The car does about 30 miles on a gallon of gasoline, and it has traveled from Paris to Bordeaux, about 360 miles, in one day without any trouble. By substituting pontoons for wheels, the car can be converted into a hydroglider.

8602
**VERTICAL SHAPER MODIFIED
 TO CUT INTERNAL GEARS**

Resembling in general appearance and in principle of operation the vertical shaper that was described and illustrated in the November, 1921, issue of Popular Mechanics, is another machine, made by the same manufacturers, that operates with a downstroke instead of with an upstroke like the one described. These two distinct types of the machine have each special advantages for different kinds of work. The downstroke machine is specially adapted for cutting internal gears, internal splines, external cluster gears, and gears in which the teeth termi-

nate near a shoulder. This work could not be done on the upstroke machine, which is specially adapted to cut plain external gears.

8412
**COAL WEIGHED AND UNLOADED
 BY LARGE BRITISH CRANE**

A British revolving crane for unloading coal cars not only picks up car and all, but weighs the coal at the same time. The car is carried in a horizontal position to the point where it is to be dumped; one end is then raised until the coal is discharged.



This Revolving Crane Picks Up Loaded Coal Cars and Dumps Them Also, Weighing the Coal as It is Discharged.

*Stevenson Gear Co
 Indianapolis Ind.*

*mitchell appliance
 Dyersburg and Memphis*



CRUDE ALBANIAN BRIDGE BUILT ENTIRELY OF WOOD

COURTESY, WILLIAMS SERVICE

THIS wooden bridge spans one of the swift streams of Albania and is built entirely of wood, even to the supporting piers in the stream itself. The bridge is more than 40 ft. high, so allow for the passage of river craft. The rustic effect, due to the timber construction, gives the bridge an appearance very different from the usual steel bridges, yet the structural principles involved are the same.

8320

DURABLE REFUSE CONTAINER MAY BE MADE ORNAMENTAL

For keeping streets and grounds free from rubbish, without detracting from the general appearance of the surroundings, an ornamental waste-paper and refuse container has been placed on the market. It is a square-shaped steel can with a self-closing cover, through which is dropped a canvas sack which is the container for refuse thrown into the can. On its four sides are



spaces for pictorial advertising posters, and above these for street names.

Jay Gee Mfg. Co.
Rock Island Ill.

859

PRODUCE EFFERVESCENT MILK AS CARBONATED BEVERAGE

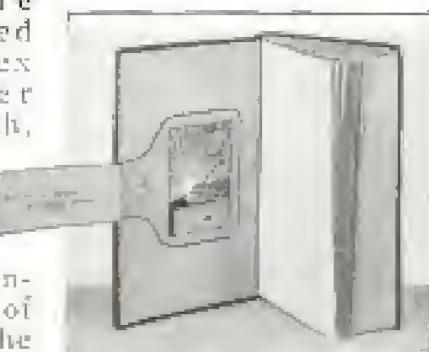
The fact that pure sweet milk is one of the most wholesome and nourishing beverages has led to many attempts to find a method of preserving it. A patent has recently been granted for a process of preservation by which milk is con-

verted into an effervescent beverage which may be kept for long periods, much as is now kept grape juice or ginger ale. The milk is first agitated under vacuum, at a temperature of from 95° to 101° F., for a few minutes to remove foreign flavors, and is then cooled to 40°, carbonated at high pressure, and bottled. It may then be kept for months under proper conditions of temperature, and when used will be found as fresh and wholesome as when first bottled.

8319

INEXPENSIVE BOOKMARK PASTED INSIDE COVER

"Losing the place" because of not having had a bookmark available to place between the pages, need not perplex the reader henceforth, if he but make use of a simple and inexpensive article of this kind. The marker consists of a piece of paper, which is intended to be permanently pasted on the inside of the cover, and which has a flap long enough to be placed anywhere in the book.



Chemical Age
118 E 28th St New York

The Blaine-Thompson Co.
4th National Bank Bldg.
Cincinnati, Ohio.

THE IVORY CARVERS OF BERING SEA

BY G. DALLAS HANNA

*Academy of
Science San Francisco, Calif.*

WINTER life in the frozen North is often supposed by those unfamiliar with it to be as dull as a grounded ice floe. It is pretty generally believed that the long nights are spent around a smoky seal-oil lamp with the streams of conversation frozen solid like the tundra. But this is a mistaken notion and far from true.

When the sun sets and does not come back to greet us until late in the forenoon, those are the days when the Northland awakens; then begins the real business of living for the enjoyment of life. Then the sleigh bells jingle in the twilight and the moonlight; the parties, the dances, the hunts, make one continuous season of pleasure from about November until—well, until the outsiders and their ships begin to appear again in the spring. The awful blizzards of which explorers are so wont to tell, really do not enter into the calculations of resident inhabitants to any large extent. They inspire about as much fear in the heart of an Alaskan as the crossing of a street does to the average city dweller.

The summer season is looked upon as a drudgery by most northerners. It is a necessary evil to be endured only because a living must be earned. Most of the annoyances of life come in the summer; the mosquitoes, the gnats, the flies, and the rains and fogs which are immeasurably more disagreeable than the ice and snow.

Two to four months' work in the summer season ordinarily suffices to provide the average family with sustenance the entire year. Of course, all work does not cease when the snow begins to fall, but that which follows appeals to the people in a most unmistakable manner.

Boats are overhauled and put away for the winter; sleds are repaired and winter gear in general is put in shape for the season.

The native villagers of the North have a peculiar philosophy, and volumes have been written about their manners and customs. I, however, shall endeavor to

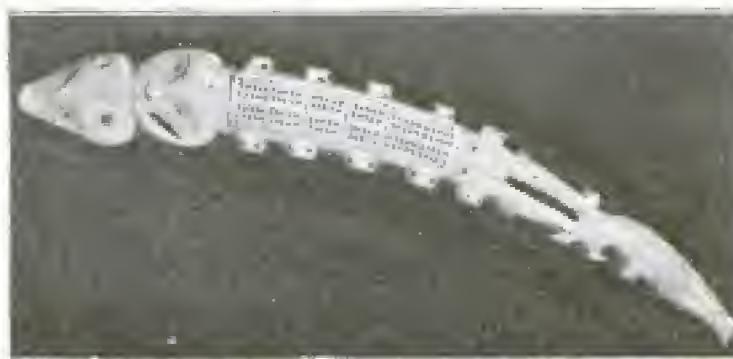
tell of a particular class of workers who ply their trade almost entirely in winter. These are the ivory carvers, of whom almost every village can boast one or more.

Before the advent of the white man, the northern natives, the Aleuts, and the Innuits or Eskimos, had to depend upon ivory for the manufacture of certain implements essential to their existence. Knives, spears, arrows, needles, axes, harpoons, and many of the ornaments of person or apparel were made of this material. The white man brought tools of iron which, of course, soon displaced the ivory entirely, so far as utility was concerned. But the tools so superior for other purposes were also found to be far superior for the carving of ivory. Files, knives, saws, and lathes from the great and mysterious "outside" were incomparable to the flat stones which had formerly been used.

The natives have found that while the ivory is no longer a necessity to them, it can be made into trinkets and ornaments of various kinds that readily sell to summer visitors at good prices. At King

Island, a short distance from Nome, almost the entire male population engages in the trade, and at almost every village up and down the coast the work is carried on to a greater or less extent.

The ivory used in this work comes almost exclusively from the walrus. These



This Very Ornate Cribbage Board was Carved from a Single Walrus Tusk with the Most Primitive Tools



Strings of Beads, Made from the Smaller Pieces of Walrus Ivory, Are the Most Profitable Product of the Carver, Sometimes Bringing as Much as 50 Dollars

animals are still fairly common in many parts of the North, thanks to the protection which our government has given them. Natives are permitted to kill them for their own use, but the skins cannot be shipped from Alaskan waters. In addition to the tusks of the slain animals, some use is made of those which have been buried in the soil for ages and have become semi-fossilized. These are black or brown with time, and the most highly prized of all ivory. Also, in some places the tusks of the prehistoric mammoth, that elephant, are used. called "mastodon ivory." The average walrus tusk weighs about

4 lb., and the usable part is an outside shell from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick. The center is occupied by "the core," a hard but more or less bony substance of mottled appearance. The ivory portion is much harder than ordinary elephant ivory and takes a much more brilliant polish, but does not possess the well-known "grain" of elephant ivory.

The ivory carver has four stock articles of trade, for which he always finds a ready sale. These are beads, cribbage boards, napkin rings, and crochet needles. Besides these, a long list of sundry objects, suiting the fancy of the individual workman, could be made. Naturally the workmanship cannot compare with that of some of the Chinese whose feats with elephant ivory are almost unbelievable.

Still, I have seen some paper knives with lacery work which could hardly be improved. And the making of a chain necklace, with tassels on it, of a single piece of ivory, requires patience and skill and a

perfect knowledge of the physical properties of the raw material.

The greatest ingenuity of the native is displayed in the fashioning of his working tools. In one village at the mouth of the Kuskokwim River, the ivory carver's outfit was very simple. He had a sheath knife, an all-purpose implement, which was

called into use almost constantly. A saw he had made of a piece of barrel hoop which he had found on the beach. It mattered little to him if it took a day or a week to saw off a tusk. He used a bow drill, just as his fathers had done, and for points he had three nails which he prized very highly. With this outfit he was able to do most beautiful pieces, one of which was a cribbage board.

The devising of a lathe is the most difficult of all feats for the native, and some queer contraptions are doing turning duty. As an example may be mentioned one built by Neou Tetoff, a Pribilof islander, for the making of beads. The essential parts are two brass gears salvaged from an old worn-out Russian belfry clock. The larger one is turned by hand, and to the smaller is attached a shaft

with a sort of chuck for holding either the work or the cutting tool.

Ivory beads are about the most profit-



A Young Walrus Whose Tusks Are Not Yet Large Enough to Be Valuable: These Animals are Protected by Game Laws, but may be Killed by the Eskimos for Their Own Use

long-haired arctic elephant. These tusks are usually

called into use almost constantly. A saw he had made of a piece of barrel hoop which he had found on the beach. It mattered little to him if it took a day or a week to saw off a tusk.



A Native Carver Cutting Beads with a Simple Lathe Which He has Made from Parts Salvaged from an Old Clock

able of all objects for the native, because the market is not flooded; little material is needed, and they are easily sold at 10 cents each or \$10 per string. In this work two methods are followed. In one the ivory is turned and the cutting tool is held in the hand. The bead is made and polished while turning, then cut off and drilled. In the other method the ivory tusk is sawed into cross sections, the thickness of the diameter of the bead, and then the holes are drilled. The tool is then revolved while the material is held stationary. For this purpose a hemispherical tool is used, which has a guide to fit the hole in the bead. One side is cut at a time, and then the work is reversed.

1555

LUNGS AND ARTERIAL BLOOD STUDIED IN THE ANDES

James
2/24/22
8.6

For three months a group of Anglo-American medical investigators studied respiration and blood changes at high altitudes in the Andes, and have now returned to their native countries with some scientific discoveries that may be of value in the treatment of diseases of the heart and lungs. At Cerro de Pasco, Peru, a mining town of 9,000 inhabitants, 14,280 ft. above sea level, a laboratory was established. The subjects for study were divided into three groups—the resident population of engineers who have lived several years at this high altitude, the natives who have been there for generations, and the members of the visiting party. In every case it was found that the arterial blood, instead of being 95 to 100 per cent saturated with oxygen, as it is normally at sea level, was only 80 to 90 per cent saturated at this high altitude. This disproved the theory held by some physiologists that under conditions of oxygen deprivation, the lungs can secrete oxygen to make up for the deficit.

The Bureau of Mines is soon to undertake the study of the preparation of phosphor copper by electric smelting direct from phosphate rock.

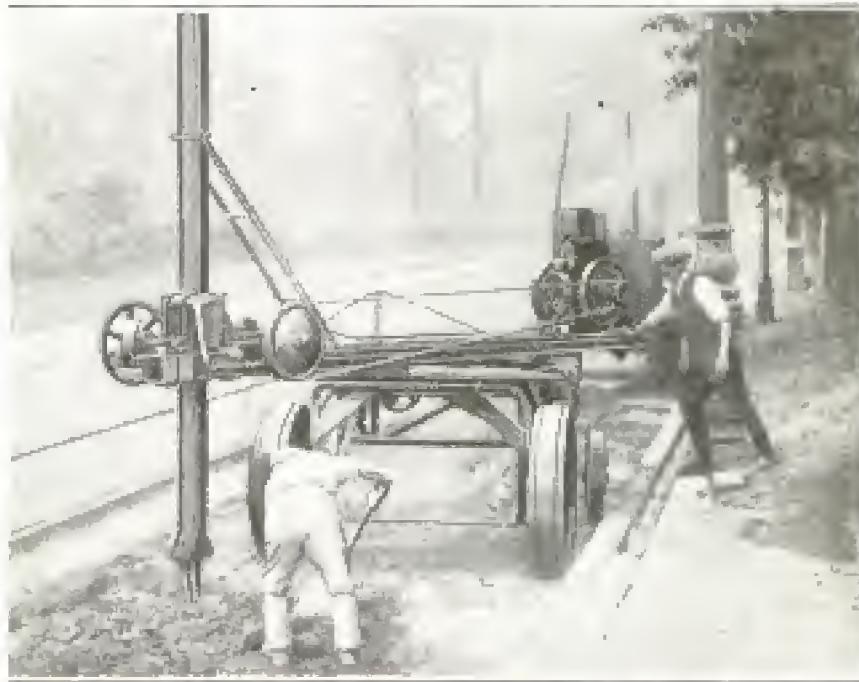
and the bead released. The truing up and polishing is a separate task. Of course, fairly elaborate shop equipment is required for constructing the tools needed in this latter process, and the beads turned out are superior to those produced by the other method.

Of late years I have seen considerable modern equipment assembled by the ivory carvers. Chisels, bracket saws, hacksaws, breast drills, jewelers' files, etc., are quite common, and once in a while a real foot-power lathe is seen. But while the work turned out is eagerly bought by amateurs, it really does not possess the attractiveness of the pieces made with the crude implements of the past.

ROAD-REPAIRING MACHINE

RESEMBLES PILE DRIVER

Resembling a small pile driver in action, an English road-working machine consists of a frame on four wheels, that sup-



Road-Repairing Machine being Used to Break Up the Surface of the Road;
The Cutting Tool and Engine are Mounted on a Swinging Beam
Which Permits Operation over a Width of 8½ Feet

ports a swinging beam which carries the tamping or cutting tool and the driving engine. The beam moves horizontally across the work, and the forward movement is obtained by pulling or pushing the entire vehicle. The tamping weight is 150 lb., and 55 blows with a 24-in. stroke can be delivered in one minute. On surface cutting or tamping, the machine will operate over a width of 8½ ft., and is efficient at a depth of 16 ft. when placed beside a 4-ft. trench, or ditch.

Messrs Johnson & Son
Copyrighted material
Leeds, England

764 POPULAR
Milwaukee Wis.
MECHANICAL WIPER AN AID
TO STREET-CAR MOTORMAN

8438 Much inconvenience is experienced by motormen when the glass window in front of them becomes obscured in bad

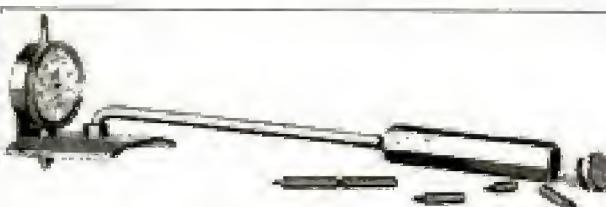


Mechanical Wiper That Enables the Motorman, by Slightly Turning a Handle within His Reach, to Keep the Window in Front of Him Clean in Bad Weather

weather, and consequently on the street cars of Milwaukee a simple mechanical wiper has been adopted. The wiper, in the form of a metal bar carrying a rubber strip, is mounted on the outside front of the car in such a manner that the motorman, by slightly turning a handle that is located inside the car, moves the wiper radially across the glass surface, and cleans a considerable area of the window. This wiper is installed on over 1,000 cars of the Milwaukee system.

8499 ACCURATE CYLINDER GAUGE
WITH REGISTERING DIAL

For the use of garages and small repair shops, a portable cylinder gauge has been developed. The diameter of the cylinder is measured between two contact points and any variations are shown by the pointer on the dial. Five contact points of different lengths are provided, which can be carried in the hollow handle.



When This Gauge is Inserted in a Cylinder, the Diameter is Measured Between the Contact Points, and Irregularities are Registered on the Dial

MECHANICS

DENSE FORESTS OF RED CEDAR
IN BRITISH EAST AFRICA

So greatly is the American production of pencil cedar decreasing that it is predicted that in the near future the only source of supply may be Kenya, in British East Africa. Kenya is a great volcanic mountain, the lower slopes of which are clothed with dense forests of red cedar, said to be the largest in the world. This source of supply is as yet almost untouched. The district can be reached by the Uganda Railway, and if low enough freight rates were provided, there is no doubt that a considerable export trade would soon be developed.

8492

HIGH-CLASS IGNITION SYSTEM
FOR POPULAR LIGHT CAR

A new ignition system has been devised for a well-known small car which can be installed without disturbing the regular wiring, and which, it is claimed, will eliminate most of the troubles caused by faulty ignition. With this new unit the vibrator points are no longer needed, as one set of breaker points in the timer performs all functions. The condenser of the unit is wired in series with the magneto in such a way that a strong uniform current is always available at the spark plugs even when the engine is running slowly, and this results in much smoother running of the car, which is always desirable.

GOVERNMENT SAVES FUEL OIL
ON NAVAL VESSELS

Economies in fuel-oil consumption aboard ship have been worked out by navy engineers. By changing the fresh-water distilling plants from high pressure to low-pressure double-effect operation and using exhaust steam for power, a saving of approximately nine tons of fuel oil per day was made on the battleships and three tons on the destroyers. At an average cost of \$2.10 per barrel, this represented a daily saving of \$141.75 on the battleships and \$47.25 on the destroyers.

Jno. W. Keay, Bureau
of Navigation, Navy Dept.
Washington, D.C.

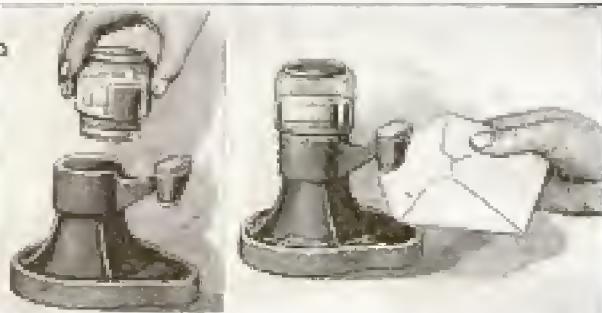
863
Drawn Age
2/23/22

**NEW SAFETY CODE AVAILABLE
PERTAINING TO GRINDING**

For the use, care, and protection of grinding wheels, a safety code, which has been in the course of preparation for two years, has lately been published. The sponsors of the code are the international association of industrial-accident boards and commissions, and the grinding-wheel manufacturers of the United States and Canada. The new code is said to be a distinct improvement over the others previously issued by the grinding-wheel manufacturers, and contains valuable information which is not to be found in any other publication.

8469
**ENVELOPE MOISTENER HAS TRAY
FOR ACCESSORIES**

Office and bank employes will appreciate a new envelope or finger moistener introduced by an eastern manufacturer, which has a metal base containing several handy trays for rubber bands, pins, clips, etc. The moistening pad is held in a bracket so that either the top or bottom may be used in sealing envelopes, sticking stamps, or counting money.



Envelope and Finger Moistener: Left, Replacing Water Container after Filling; Right, Moistening an Envelope Flap

glass reservoir, easily removable for filling, is fitted into the top of the appliance, and the whole arrangement serves as an ornament to any desk.

8011
Access
**HANDY AUTOMOBILE WASHER
SAVES SOAP AND VARNISH**

Specially constructed for use in washing automobiles, a newly invented bucket keeps the soapsuds always clean, and eliminates injury to the varnish on the car caused by undissolved soap, or what is worse, from the sand and gravel that is so often transferred from the dirty car to the water. While it thus saves all the varnish, it is said that it also saves half the soap. Inside a strong galvanized-iron

bucket is a screen and soap container that are raised from the bottom of the bucket so as to leave a space beneath them into which any sand or gravel drains. The



Pail for Washing Automobiles: Left, Partly in Section, Showing Sand Screen and Soap Container; Right, Screen Removed from the Bucket, with Soap Container Open

soap container on top of the sand screen is cylindrical, and perforated so that all the soap must dissolve before it can get into the water. On the outside of the bucket are spring wire holders for sponges, which are thus kept off the floor.

Access
**SMALL PHONOGRAPH MOTOR
FITS ANY INSTRUMENT**

Winding a phonograph is tiresome to most people, and the introduction of a small electric motor, which has been designed to eliminate this work without necessitating any change to the machine, will therefore undoubtedly be appreciated. The apparatus is mounted on a base that permits it to be placed beside the phonograph turntable, which is revolved by a rubber wheel, or pulley, on the motor. The motors are manufactured for either alternating or direct current, at 110 volts, the average operating cost being but five cents per month; they are controlled by the speed regulator on the phonograph, and automatically stop when the record is completed.



At the Upper Left is Seen the Small Motor with Rubber Pulley, or Wheel, While at the Right It is Shown Mounted on the Phonograph

Access
**Simplicity Alternating
Corp. & New York.**

850.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

This Heater for the Sick Room Has a Small Electric Bulb Placed between Two Perforated Plates. A Fleece or Flannel Cover is Provided and a Heat Regulator is Connected in the Cord



A Water-Power Egg Beater That can be Attached to Any Faucet and Also Used for Mixing Small Cakes



Mop with a Small Wringer on It So That the Dirt and Water can be Squeezed Out: An Adjusting Spring Allows the Wringer Tension to be Set as Desired



Traveling Clothespin Bag Which can be Moved along the Line upon Wire Supports, Thus Keeping the Pins Clean and Saving Much Stooping



On This Wire Screen the Bread or Cake Cools with Air Touching All of Its Sides, Which Eliminates Sogginess



Combination Fork and Spoon Made of Aluminum can be Used like a Pair of Tong for Lifting Hot Meat, Eggs, and the Like



Collapsible Enameled-Steel Seat for Baby, Which Has Straps for Attaching to Ordinary Chair or to the Seat of an Automobile



This Convenient Bag Has a Removable Compartment Containing the Necessary Toilet Articles Used While Traveling

INTENDED FOR THE HOME AND ITS MEMBERS



Two Views of a Metal Drapery and Curtain Support Which Allows the Side Draperies, Valance, and Lace Curtain to be Hung Independently

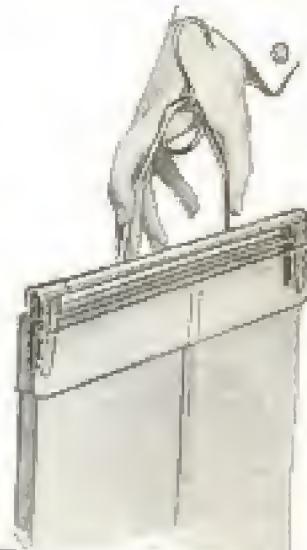
This Polished-Iron Griddle Has a Hollow Base Which Prevents a Gas Flame from Overheating the Center, and Distributes the Heat Evenly



Potato Masher and Beater Made of One Slotted Bar Inserted in a Handle: The Curve in the Mashing Surface Gives Great Strength to the Appliance



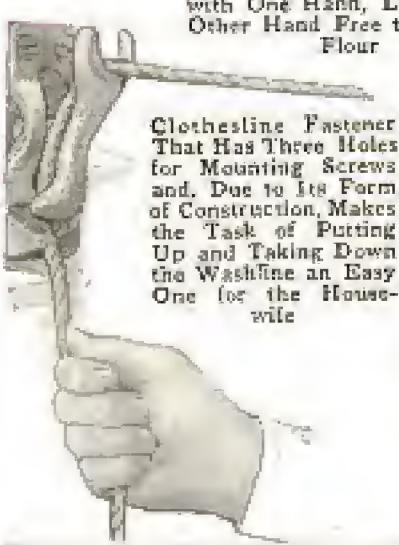
This Electric Cooker Is of Light Construction and Is Especially Valuable in Sick Rooms. Besides the Oven Which is Used to Cook Steaks, Chops, Fish, and the Like, This Appliance Has a Griddle Fastened to One Side and a Hot Plate on the Other



Trouser Hanger Which Works on a New Principle, as the Supporting Parts are Placed Inside of the Garment and Leave No Mark



This Rolling Pin is Operated with One Hand, Leaving the Other Hand Free to Sprinkle Flour



Clothesline Fastener That Has Three Holes for Mounting Screws and, Due to Its Form of Construction, Makes the Task of Putting Up and Taking Down the Washline an Easy One for the Housewife



Convertible Porch Swing and Hammock Which is So Constructed That the End Members can be Shifted Readily from the Normal Vertical Position to an Inclined or Horizontal Position

Mr Maurice E. Belgrains
358 lace de la Haie
768 Antwerp Belgium

N.Y. Times

2/17/22 P. Belgrain

8371 HANG UP PHONOGRAPH RECORDS
IN FILING ENVELOPES

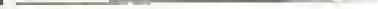
A new device for filing phonograph records has been patented in Germany and consists of a heavy paper envelope having a cardboard hanger at the top. The bottom edge of the envelope is also of cardboard so formed as to prevent the record from rolling out. Space is provided for indexing on the lower corner of the envelope, so that the figures are plainly visible when the records are hung in the cabinet.



DOOR HINGE SAVES FINGERS
FROM BEING PINCHED

Pinched fingers are a common occurrence when children play near a door, and to prevent this painful injury, an inventor has constructed a new door hinge. The invention consists of two bases or plates, which are attached to the door and casing respectively, and integral cylindrical

knuckles that have a pivotal connection between the plates. A three-quarter round brass tube is fitted over the corner of the door casing between the hinges and at the ends, thus closing the space which is found upon opening the ordinary door.



When you want anything and do not know where to get it, write Bureau of Information, Popular Mechanics, Chicago.

8373 WARSHIPS TO BE CONVERTED
INTO A BREAKWATER

Instead of entirely scrapping 12 of the warships that have to be destroyed in accordance with the terms of the armament conference, recently held at Washington, it is proposed to turn them to profitable use by taking them to Los Angeles, and sinking them so as to form an extension of the San Pedro breakwater. It is claimed that in this way shelter would be provided there for eight additional active battleships.

8378 ONE-QUARTER TURN REMOVES
NEW THREADLESS DUST CAP

Threaded valve caps on automobile tires that have to be removed by a somewhat lengthy process of turning consume time, and are liable to stick. Now there is a threadless dust cap that avoids both these drawbacks. A quarter turn removes both valve and dust cap at once. The cap

case is forced by a coiled spring upward against lugs on the base nut, and a quarter turn brings the lugs opposite slots in the cap and releases it.

8611 SHORT-LEGGED" FURNITURE
LEVELLED BY CASTER CUP

Furniture having one short leg is a source of constant annoyance in any home, and as a remedy for this common fault, a caster cup has been produced. The cup consists of two parts, each threaded so that the upper part screws on the outside of the lower. The legs of the table, dresser, etc., are placed in the cup-shaped top, and in the event of any side being low, that particular cup is screwed up until the article stands level. The device is equally useful if the floor is uneven.



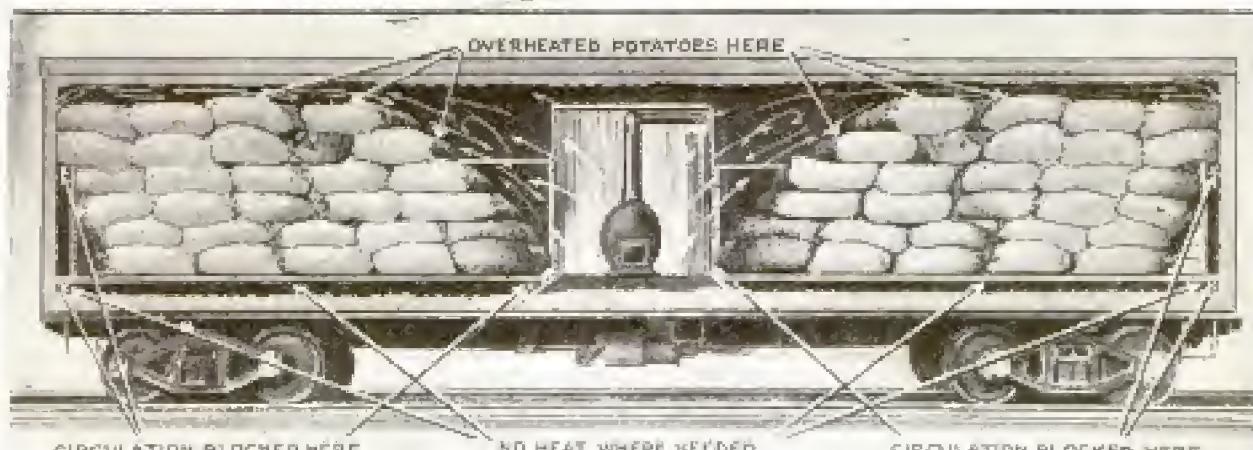
Clifford G. Berry, Lester
Baptist, Sargent
Munroe poles, Miami

8040

Cont. C. Moran

88-25-12th St. N.W. Washington

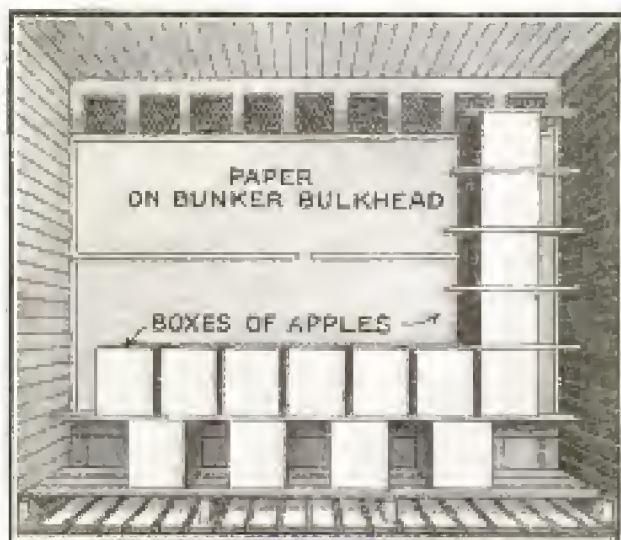
CONVERT REFRIGERATOR CARS FOR WINTER USE



Above: In the Heated Box Car, as Ordinarily Arranged, the Freight near the Stove is Overheated While Other Portions of the Load Freeze.

Converting a refrigerator car into a heater car for perishable freight during freezing weather, is a recent accomplishment that makes possible not only the utilization of thousands of refrigerator cars in the winter months, but a saving of the \$2,000,000 of perishable products annually lost on account of freezing while in transit.

The conversion is made simply by providing an uninterrupted passage-



Left: From the Heater, Warm Air is Circulated around the Load. Below, the Lower Tier of Boxes is Spaced to Form Passages

way all around the load in a car, so that a constant and uniform circula-

tion of warm air from a heater in the center of the car can reach all parts of the load. It is merely a recognition of the fundamental principles of the movement of hot and cold air. When the circulation of warm air is obstructed, the produce at the top of the car is overheated, while that at the bottom of the car freezes.



In a Properly Converted Box Car the Protecting Heat from the Stove Rises to the Top of the Car and Circulates around the Load, Returning along the Passage Formed between the Temporary Rack and the Car Floor, Thereby Insuring a Proper Temperature in All Parts of the Lading.

To overcome obstructions in the shape of high splashboards at the bottom of the bunkers, and floor racks with transverse supporting strips instead of longitudinal strips, an additional floor rack, with longitudinal stringers not less than four inches high, is placed upon the permanent floor rack. This temporary rack is papered to the center of the car. Open bulkheads are also papered from just below the openings near the ceiling of the car to the top of the first layer of boxes next the bunkers. Bunker bulkheads of the solid type with open spaces at the top and bottom need not be papered.

In loading, the first or bottom layer in the stacks of boxes next to the bunkers consists of only four boxes, spaced so that the bottom boxes in the second stack cannot slip into the spaces between the boxes in the first stack. On top of the

first four boxes two 1 by 6-in. boards are nailed to support the remaining five layers. When the car is fully loaded, paper is placed across the top of the load as far as the bracing in the center of the car, so that warm air from the heater will move to the center of the car before returning to the bunkers. When possible, the ice grates in the bunkers are raised and the heaters placed on the floor of the bunkers, thus providing a lower plane from which the heaters can draw their supply of cold air.

By the use of this system of lining and loading refrigerator cars, adequate control of fruit temperatures can be secured, no matter how low the outside temperature may be. The same principles applied to box cars enable that class of equipment also to be used in heater-car service, with no danger of loss by freezing.

London Times Trade & Eng. Supplement

TWO NEW DYES DISCOVERED

8536 IN COAL-TAR PRODUCTS

A new chemical reaction which can be employed in making dyestuffs from coal-tar products has been discovered by a Canadian university professor. Two new compounds, one a blue and the other a beautiful shade of rose, have been produced. The professor is now engaged in determining definitely the chemical constitution of these compounds, and in devising methods for their production in quantities suitable for manufacturing purposes.

8536

PISTON OF IMPROVED DESIGN
SAVES OIL AND GASOLINE

Pistons for automobile motors that are guaranteed never to cut or wear the cylinders out of round, and to reduce the gasoline bills from 30 to 50 per cent, and the oil bills from 60 to 80 per cent, have several novel features that are claimed to be the cause of this superiority.

Screwed on the body of the piston are a head and a liner, with an asbestos gasket between them, that keeps the body from becoming heated. These are made of aluminum. Under the head in a groove is a three-piece piston



on the page being read. When one page is turned, the weighted strip falls back to the second, so that there is no danger of the reader losing his place if the book is hurriedly closed.

Eng. Suppl.

8549 PROPOSED OIL-PIPE LINE
FOR ARGENTINA

Feeling that the Comodoro Rivadavia oil fields in Argentina are sufficiently proved to justify the expense, it is now proposed to construct an 8-in. pipe line from the field to Buenos Aires for transporting the oil. The distance will be nearly 850 miles and the carrying capacity of the pipe almost double the actual production of the wells at the present time, but new development may alter this.

Times Trade & Eng. Signal The International
Piston Co., Elyria, Ohio

2/18/22

H. A. Lee Tool & Mfg. Co.
310 W. 20th St.
Kansas City.

POPULAR MECHANICS

8396

ADJUSTABLE CRANKPIN TOOL

EASY TO OPERATE BY HAND

Worn, or out-of-round, crankpins can be trued up with a new hand tool, without removing the motor from the car, in



Tool for Truing Up Worn or Out-of-Round Crankpins on Automobile or Stationary Engines without Removing the Crankshaft: The Feed Screw Adjusts the Cutting Blade

ring, made of special low-friction metal, behind which are asbestos packing and a vanadium-steel spring, which seal the piston-ring groove, and prevent oil and gasoline leakage.

8515 d.a.m.a 2/8

WHY BACTERIA IN THE MOUTH ARE GENERALLY HARMLESS

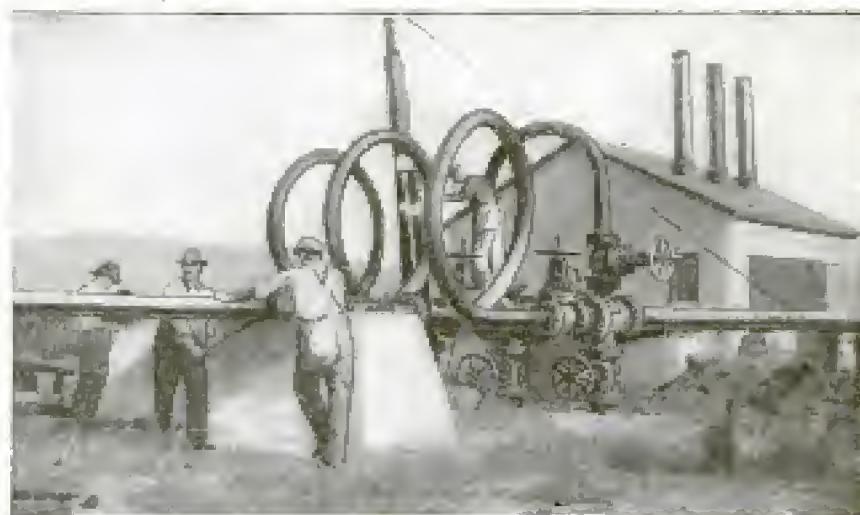
It has hitherto been assumed by pathologists that the bacteria which are known to lodge in the cavity of the mouth in seething masses are disease producing, and that they are always present to take advantage of any unfortunate lowering of the powers of resistance in the human body. It has now been demonstrated by a professor at Johns Hopkins University that although the oral cavity has no elaborate system of hairy membranes like the nose and air passages, to rid it of bacteria and foreign particles, nevertheless it does the same thing by a mechanical action of the muscular structures around the mouth that set up suction currents which remove any bacteria or foreign particles from the mouth in from 15 to 30 minutes. These suction currents carry the bacteria uniformly toward the rear of the mouth, without any lateral or forward dissemination, and pass on without lodging on the tonsils or the walls of the pharynx—the pouch that forms the back part of the mouth.

8552

ARTIFICIAL PLASTIC WOOD JUST LIKE REAL TIMBER

An artificial wood that is so like the real thing that it can be worked with carpenters' tools and finished with a file or sandpaper, is now being produced by an English manufacturing company. The material is known as plastic wood, and at first it has the consistency of a thick paste, and can therefore be molded into any shape. It can then be hardened by exposure to the air, and becomes a tough, solid, waterproof substance. It is expected to be of special use for making patterns for castings. It can also be used for filling in flaws in timber, or openings at joints, and will take paint, stain, or varnish like real wood.

In long pipe lines for carrying oil the difference in length due to expansion and contraction is a very serious matter and must be compensated for by some means. One of the most simple methods is by forming, at intervals in the line, large



When the Pipe Line Expands on Account of the Heat, the Large Coils Compensate for the Increased Length and Prevent Damage

coils which allow for expansion and contraction without damage to the pipe line.

Times Trader & Eng. Signal
2/8/22

Copyrighted material

8501

CHILDREN'S PICTURE-STORY DEPARTMENT



Here Is Decidedly the Sweetest House in the World, or at Least Sweeter than Any Other Unless It is Built as This One Is—Entirely Out of Candy. The House, with Its Waterwheel and Its Interesting Surroundings, Is of Home-made-Candy Construction, Built by a Candymaker in Cincinnati, Ohio. It was Exhibited in This Manner in a Show Window.



*I painted by a London engineer
Exhibited at Horticultural Hall, Westminster,
London, England*

Any Boy or Girl Who has Read—and There cannot Be Many Who have Not—Fenimore Cooper's "Last of the Mohicans" will Remember the Historic "Cooper's Cave" at Glens Falls, New York, Where the Author Himself Hid from the Indians. Here Is the Cave, or Rather the Entrance to It, on the Bank of the Hudson River. From This Pear-Shaped Entrance, Seen in the Center of the Picture, a Winding Staircase Leads to the Cave Itself.

Joy-Riding by the Dozen: This Is Not a Case Where Two Is Company and Three Is a Crowd—Quite the Reverse, the More the Merrier. The Wee Bit of a Traction Engine Is the Work of a London, England, Inventor, Who Recently Caused Quite a Sensation by Appearing on the Streets in This Manner with a Wagon Load of Enthusiastic Youngsters. The Tractor Was on Exhibition at the Horticultural Hall, Westminster.

Mr. Ernest N. Grove, Jr.
1131 Colorado ~~Spring~~⁸⁵⁰¹
Glenwood Springs, Colo.

OF MODERN ACTIVITIES AND INTERESTS

This Carriage Glides over the Snow in the Same Manner That Speed Wagons Roll over the Ground, by Moving the Handle Back and Forth. It Has a Saddle like a Bicycle, Where the Rider Sits and Grasps the Handlebar with Both Hands



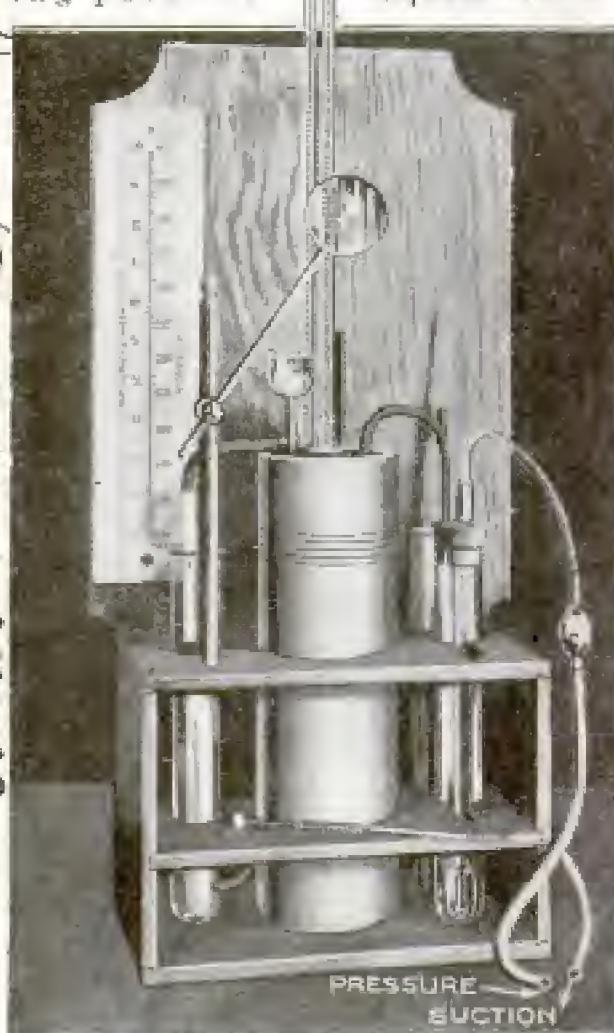
At the Left Is Wilmette Huggins, Wisconsin's Blind and Deaf Super-Girl, Chatting with Helen Keller, the World's Most Widely Known, Deaf and Blind Woman. In Many Ways They Are Two of a Kind, but Not so Regards Their Methods of Listening. Miss Keller Does It by Holding Her Fingers to the Speaker's Lips, While Miss Huggins Rests Her Finger Tips on the Speaker's Chest

Three Kittens That Are the Petted Mascots of the Air-Mail Hangar at Omaha, Nebraska: Being Bearers of Good Luck, They are Allowed to Go as They Please Anywhere and Anyhow in the Hangar, or over the Airplanes, in Which They have Made Many Flights. The One at the Left, Seated on a Tailplane, is Called "Spark," and is Yellow—in Color Only, Not in Any Other Sense. The Two at the Right, Called "Contact" and "Tailskid," are Reposing on the Wing of an Airplane

Apparatus sold by: 3rd Avenue
Chemical & Mineral, New York City

Julius Hertel, State
Dairy + Food Chemical
Laboratory, Old Capitol,
1743 Pop. 11,000
1863 M. Paul, Minn.
**APPARATUS THAT TESTS MILK
FOR ADULTERATION**

Adulteration of milk is easily determined by the use of an appliance invented by a Minnesota chemist for the purpose of measuring the freezing point of liquids. As the



Apparatus for Determining the Percentage of Milk Adulteration, Showing the Thermometers, Test Tubes, and Heat-Retaining Bottle

freezing point of milk is -55° Centigrade (very nearly 1° F.) below that of water, the sample to be tested is placed in a vacuum tube, similar to a heat-retaining bottle, and cooled by means of an air and ether mixture. If the milk freezes before it has been cooled to a temperature of 31° F., the presence of water in excess of the normal is evidenced, and the percentage of additional water can be calculated by means of a properly calibrated scale.

Those wishing further information on anything described in the editorial pages can obtain it by addressing Bureau of Information, Popular Mechanics Magazine, Chicago.

VEGETATION CLOTHES ISLAND
ONCE A BARREN WASTE

8516

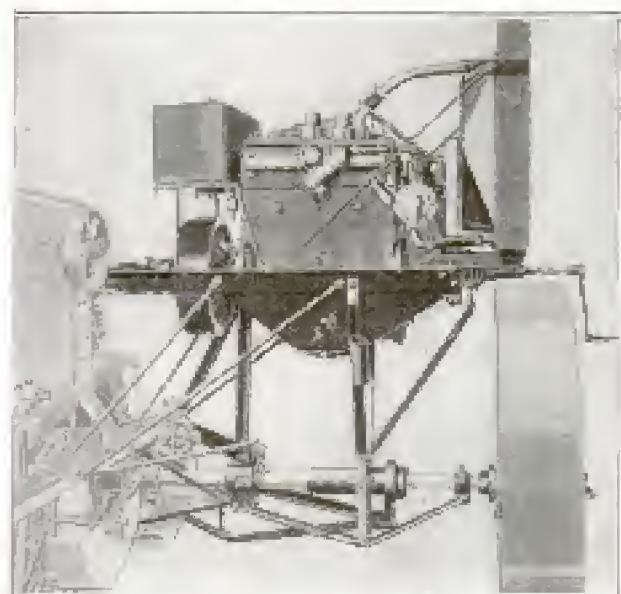
The island of Krakatoa, off the west coast of Java, has provided scientists with a natural experimental station for the study of the methods by which islands are supplied with animal and vegetable life. In August, 1883, the island was the scene of one of the most violent volcanic disturbances ever recorded, one result of which was the destruction of all forms of life on the island. Since that time it has been closely watched by scientists who have studied the return of life to the island through natural agencies. A recent expedition disclosed that the island was covered with a dense vegetable growth and that 175 different species of animal life were present.

Chicago Daily News 21/2

MOTOR TO OPERATE COMBINED HARVESTER-THRESHER

8426

A power plant to operate a combined harvester-thresher independently of the speed at which the machine is hauled, usually by a tractor, over the ground is a new development. A gasoline engine, with its radiator tank and other equipment, is assembled on a frame that can be separated from the harvester-thresher. The crankshaft of the motor is coupled directly to the cylinder shaft of the thresher, and the other operative parts are driven by chains from the opposite end of the cylinder shaft. The speed with which the machine is operated can be regulated by the motor control.



Power Plant That Operates a Combined Harvester-Thresher by Direct Connection to Its Cylinder Shaft, Independently of the Speed at Which It is Hauled over the Ground by a Tractor

Cont. George E. Mellicker
Copyright 1910 Industrial
north Bend, Neb.



Shop Notes

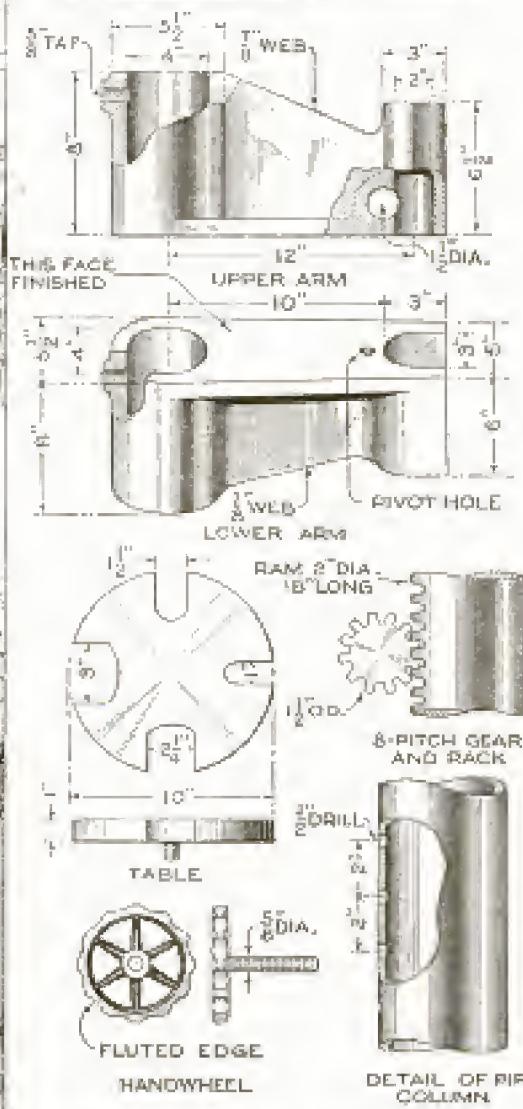
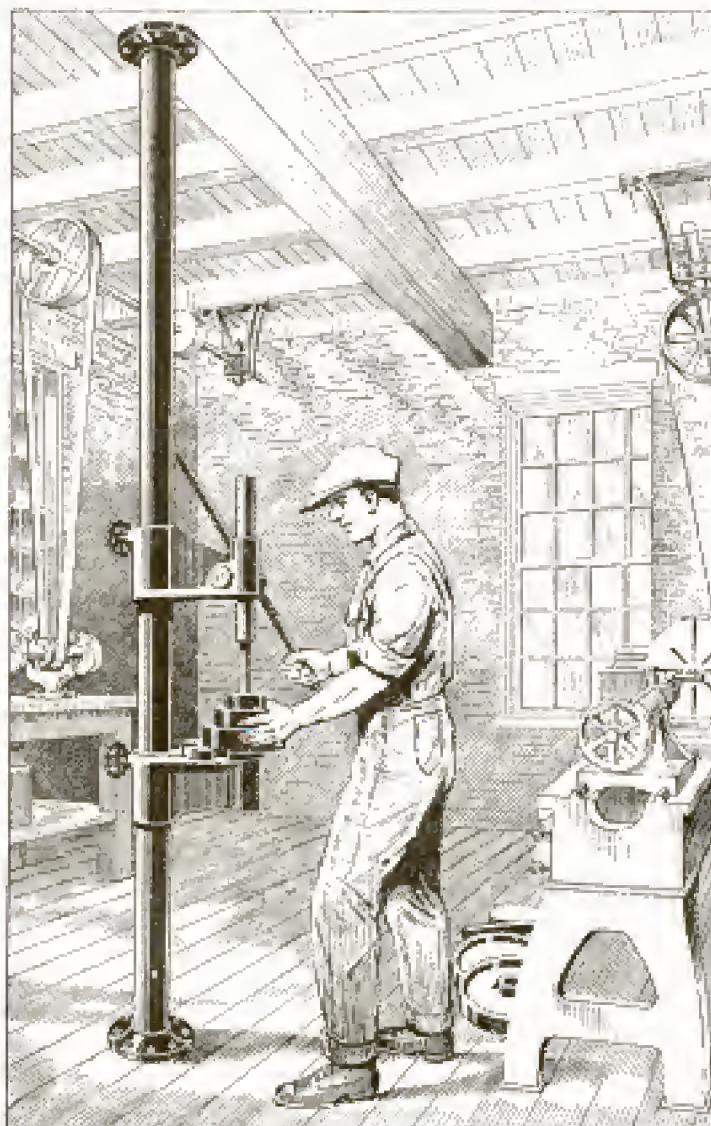
Information as to where to obtain any specified materials or parts for making objects described in the following pages may be had, on request, from our Bureau of Information.—Editor.

An Arbor Press of Large Capacity

By J. V. ROMIG

EVERY machine shop or garage doing any considerable repair work has an arbor press as part of its equipment. Most of those that I have seen and used, however, have been small, and of very little, if any, use for long work. The press described herein was designed and built by the writer with this in view, and the result is a press of large capacity, adjustable over a wide range, but not too clumsy,

The main member is a length of $3\frac{1}{2}$ -in. pipe, which has an outside diameter of 4 in.; it is drilled with a row of $\frac{1}{2}$ -in. holes, 2 in. apart, and fitted with a floor flange at each end, the over-all length being the same as the height of the ceiling from the floor. The upper and lower arms are castings, made from simple patterns; the upper arm is bored to fit the rack and gear. The rack and gear are eight-pitch,



An Arbor Press Suitable for Any Shop or Garage Where a Wide Range of Work is Handled: The Upper and Lower Arms may be Clamped Anywhere on the Column, to Suit the Work or the Operator

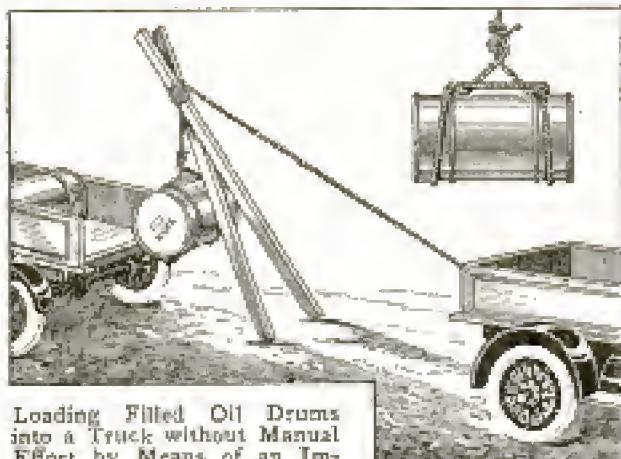
and are made and assembled as for any ordinary press. They should be of a good tough grade of steel. The gear may be fitted with a two or four-spoke handle, as desired. Care should be taken, when boring the rack and gear holes, to bore them so that the teeth will mesh correctly. The lower arm is faced on the upper surface, and drilled for the pivot on the table. The table is also a casting, or may be made of steel plate, if a large enough piece is available; it is slotted, as shown, for

work of varying diameters. The clamping screws are made with a pointed end; by means of these, both upper and lower arms can be clamped in the most suitable working positions.

If the height from floor to ceiling is too great for a column, or if overhead cranes are used in the shop, a base of large diameter can be substituted for the lower floor flange, and the pipe column cut off and braced at a height that may be most convenient.

An Improvised Crane

In loading some heavy barrels of kerosene, the driver of a truck used a simple method of elevating them to a height



Loading Filled Oil Drums into a Truck without Manual Effort by Means of an Improvised Crane: The Same Idea can Be Adapted to Other Work Where a Vertical Pull or Lift is Required

where it was possible to back the truck underneath them. Two long sticks were fastened together, near one end, with a rope, and the opposite ends were placed on the ground about 3 ft. apart. A rope was slung around the oil barrel, passed over the crotch of the sticks, and fastened to the rear axle of a second truck. By moving the second truck forward in low gear for a few feet, the barrels were lifted to a corresponding height, when the truck that was to carry them was backed underneath and the load lowered. The same method can be applied to lifting heavy stones, or other work.—G. A. Luers, Washington, D. C.

Care of Wheel-Truing Diamonds

Take only light cuts with the diamond, and as the stone wears, turn the nib in the holder to insure uniform wear; then when the stone wears down to the metal setting, reset the stone so as to expose a new cutting surface. When the diamond is worn down to a small size, reset it in

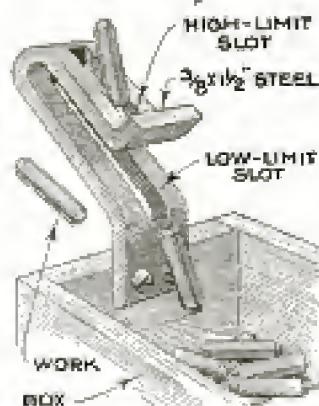
a holder, and use it in the tool room. Be careful not to jam the diamond into the wheel, and instruct operators not to allow the stone to get any violent knocks, as it is very hard and therefore brittle. Never use a diamond dry, except on small wheels for internal grinding, or on tool or cutter wheels; on large wheels for cylindrical or surface grinding, direct a copious stream of water on the diamond at the point of contact with the wheel.

Work Gauged Automatically

The gauge shown in the drawing will be found applicable to many classes of work and will save the time necessarily required for a separate gauging operation; in addition, it prevents the machine hand from turning out work that is afterward found to be incorrect.

The work shown is a sleeve with beveled ends, the outer diameter being held within limits of plus or minus .01 in. The gauge is made of $\frac{3}{8}$ -in. flat steel, the first operation being to bend it into the form shown, the angle being about 45° . The slots are next milled, the high limit or "go" slot being milled so that the ends, when the gauge is fixed in place, stand in a vertical position, to prevent the work from falling through, back end first, and probably sticking. The low limit or "not go" slot is milled in the bottom portion. It may be as well to say that in cutting the slots, the gauge should be strapped on the table, on its side, and both slots milled with an end mill. The same method is used in grinding the slots to the finished size.

Two holes, drilled and countersunk, ac-



commodate screws that hold the gage to a wooden box. As the operator cuts off the pieces in a screw machine, he catches them in one hand and places them in the top of the gauge. If the work is below the high-limit size it drops through the slot, and if above the low limit, slides down the slot into the box. If above the high limit, the piece will not drop through the first slot, while if below the low limit, it drops through that slot and onto a piece of tin, where it immediately attracts the operator's attention.

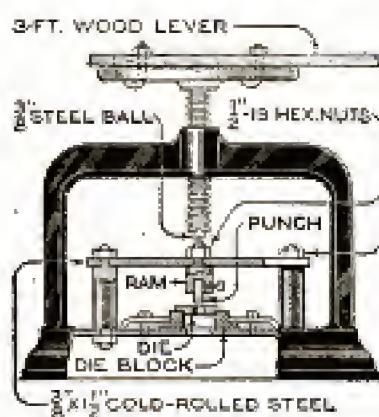
Punch Made from Letter Press

The letter press illustrated was used to good effect in an emergency when it was required to punch $\frac{1}{8}$ -in. cold-rolled stock with holes up to $\frac{1}{2}$ in. in diameter. In drilling the holes in the base of the

press, the yoke was removed; holes were cut underneath the die and in one side of the bed so that the punchings could be removed. The die is held to the bed by clamps, while the ram is bolted to a

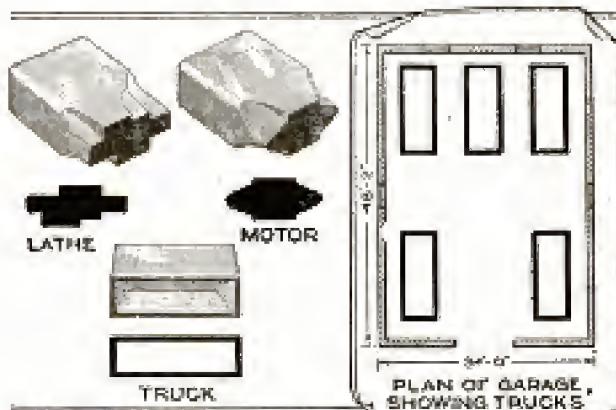
strip of thin steel supported at the proper height at each end. The punch and die being in line with the screw, a cavity is made in the upper end of the ram screw for a steel ball, which furnishes a hardened bearing and reduces the friction. After extensive use, the horizontal piece of steel holding the ram and forming a spring was not permanently bent, as the amount of deflection was not more than $\frac{3}{16}$ in. The extra leverage required to force the punch through the work was obtained by bolting a wooden lever to the handwheel of the letter press.—Dexter W. Allis, Whitman, Mass.

A "circular mil" is a term used in electrical wire measurements and is the area of a circle .001 in. in diameter. The expression "circular inch" is also met with in electrical measurements and is the area of a circle 1 in. in diameter. Hence a circular inch is equal to 1,000,000 circular mils. The circular inch is equal to .7854 sq. in., and a square inch equals 1.2732 circular inches or 1,273,239 circular mils.



Rubber Stamps for Floor Layouts

Frequently, in engineering offices, it is desirable to make preliminary plans in order to show officials or clients a sug-

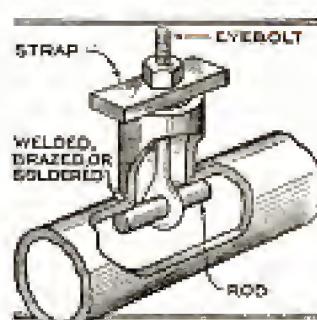


Rubber Stamps Cut from Erasers Prove Useful in Laying Out Floor Plans

gested floor layout. For example, a garage of certain dimensions is proposed; this can be outlined in a few minutes, but then the inevitable question, "How many automobiles will it accommodate?" is asked. An ordinary pencil eraser is cut to represent the space that will be occupied by the car on the scale drawing, and, using it as a rubber stamp, the entire available area may be stamped quickly to show its car capacity. In a similar manner, stamps to indicate electric motors, grinders, planers, or other tools and machines, can be made and used to indicate, on the floor plan of a factory, various arrangements to obtain the greatest economy of space.—Robert W. Shelmire, Chicago, Ill.

Clamp for Welding and Brazing Tees

A clamping tool that consists of an eyebolt, rod, and strap is of special service in holding two sections of pipe together at right angles for welding, soldering, or brazing. All parts of the clamp are generally available, and it is applied to the work as shown in the drawing. This type of clamp is of particular advantage in brazing, where the main requirement is to hold the parts without the least movement until the molten spelter sets, since otherwise the joint is invariably a failure.





FAULTS IN CONCRETE-SIDEWALK CONSTRUCTION

By A. J. R. CURTIS

Washington, D. C.

ONE of the greatest factors in the tremendously increased use of Portland cement in the last 40 years has been the concrete sidewalk. Although the concrete walk took the country by storm about the time Dewey fought the battle of Manila, and has maintained first place ever since in popular favor, a number of ordinary errors in construction still persist. Some of these mistakes are serious in their consequences, as shown in Fig. 2, endangering life and limb, and causing much needless expense. All, however, are easy to avoid, as the principles involved in laying sidewalks are simple, and the technique easy to acquire.

A concrete sidewalk should be merely a collection of independent concrete slabs, laid one beside another on a firm, well-drained subgrade. In locations where surface water disappears quickly and cannot become trapped under slabs, walks are frequently placed directly on the ground. If the slabs are laid where water is likely to become pocketed under them, either a subgrade, consisting of a 6-in. layer of cinders or gravel, or tile drainage, must be used to prevent possible heaving from frost. Where the walk is placed on an earth fill or elevation, the latter must be thoroughly compacted, and in the case of clay, or other water-bearing soil, the use of a cinder or gravel subgrade under the concrete is a wise precaution. Fills should extend at least 1 ft. beyond the walk on either side and the edges should slope off at an angle of 30°. The finished subgrade should slope toward one side at a pitch of $\frac{1}{8}$ in. to the foot, and the finished walk is usually given a corresponding pitch.

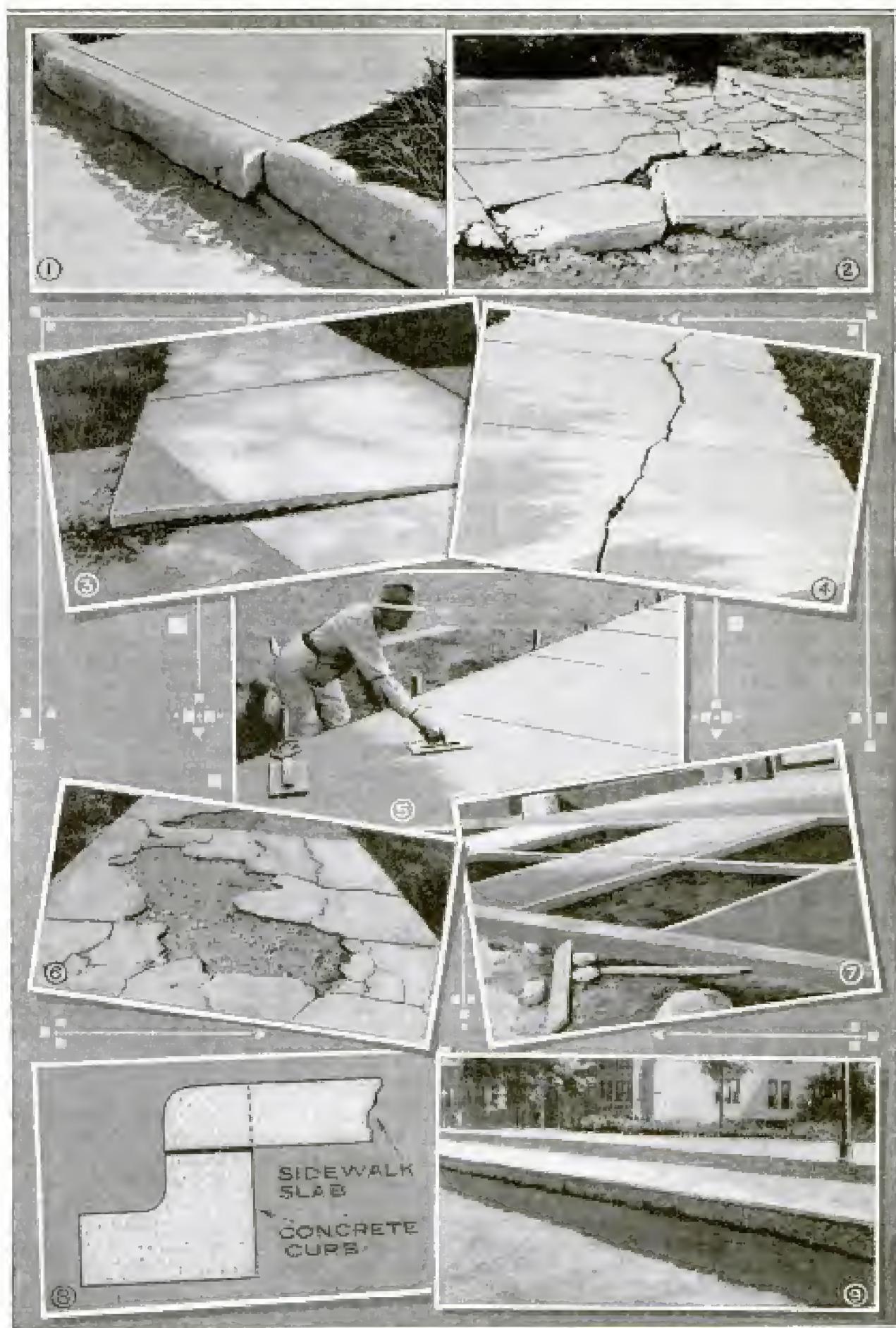
Some of the common mistakes in sidewalk construction are shown in the accompanying illustrations. Failures due to disregard, or ignorance, of the law of expansion and contraction, as illustrated in Figs. 1 and 2, and of proper concreting methods, as in Fig. 6, are the most common. Concrete has an expansion coefficient of about .00001, which means that for every degree Fahrenheit in temperature change a piece of concrete will expand or contract approximately one hundred-thousandth of its length. As a

practical illustration, a sidewalk 100 ft. long has an actual variation in length of about 1.2 in. between the extreme temperatures of zero and 100° F. If this walk were put down when the temperature was at 50°, it might be expected to expand one-half of the above amount if the thermometer reached 100°, and to contract as much from its original length if the temperature reached zero. Expansion in sidewalks may be provided for in ordinary straightaway work by leaving a space of from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. between slabs every 50 feet.

If a long piece of sidewalk is constructed in the summer, without dividing it into separate slabs, the contraction in cold weather will be sufficient to make the walk tear itself apart at one or more places, and the opening thus formed will continue to widen as the sections continue to shrink. The remedy for this, as well as for several other sidewalk difficulties, lies in making the walk a series of disconnected slabs, usually not more than 6 ft. in each surface dimension, no slab to have a greater length than twice the width. Such slabs can take whatever little movement may be required without affecting adjoining slabs. A very effective method of producing a positive division between the slabs is illustrated in Fig. 7, which shows how the slabs are laid alternately.

The need for efficient concreting methods has always been apparent in our sidewalks. Slipshod methods have been due largely to a failure to realize that the sidewalk really constitutes a very exacting use of concrete. The apparent simplicity of the thing invites careless methods. Sidewalk slabs are quite thin for their size, probably averaging less than 4 in. in thickness, exposing large areas to extreme conditions and often hard use without any protection whatever.

In starting to lay the walk, 2 by 4-in. forms are staked firmly to the desired level, the subgrade having been properly leveled, with its surface 4 in. below the grade of the finished walk. Concrete, made of approximately 1 part cement to $2\frac{1}{2}$ parts torpedo sand, and 5 parts of gravel or crushed stone, all pieces of the



In Figs. 1 and 2 are Shown the Result of Expansion; Fig. 3, a Sidewalk Slab Forced Out of Place by Tree Roots; the Sidewalk in Fig. 4 Failed Because of a Poor Subgrade, While That in Fig. 6 was Made of Weak Concrete, with Dirty Materials, and in Fig. 9 the Subgrade has been Undermined. Fig. 5 Shows the Use of the Trowel, and Fig. 7 the Proper Method of Laying the Walk. Curbs should be Cast as Shown in Fig. 6, to Prevent Their being Pushed Outward by the Expansion of the Walk.

latter, above $\frac{1}{4}$ in. in size, is then deposited to a depth of at least $3\frac{1}{4}$ in. This concrete should be sufficiently wet so that water will flush the surface under light tamping, and should be no wetter. The surface is struck off exactly $\frac{1}{4}$ in. below the top of the forms by means of a notched straightedge.

The surfacing course, composed of a mortar made of 1 part cement to 2 parts sand, is placed on the base course, usually within an hour, and always before the surface of the base has dried out. The mortar is mixed wet enough to be readily workable, but not sufficient for water to flush to the surface when troweled. The surface grade is obtained by working a straightedge across the top of the forms with a zigzag motion, removing the excess material and filling the depressions.

After the straightedge has brought the surface to a practically true grade, the wooden float, shown in the lower left-hand corner of Fig. 5, and later the steel trowel, are used to produce a true, even surface of smooth texture. The float is merely a flat wooden trowel, the surface of which is 5 by 15 in., with the corners slightly rounded. The steel trowel has the property of drawing the fine particles to the top very readily, and for that reason should be used as sparingly as possible, as excessive troweling will, as a rule, produce slippery surfaces and hairline checks.

Single-course sidewalks are made throughout their entire thickness of a single mixture—usually 1 part cement to 2 parts sand and 3 parts gravel or broken stone—and are usually 4 in. thick. It is not possible to produce as smooth a surface as in two-course work, but less material is required, and quite a little less labor. In practice, the two-course construction described above requires about 1 bbl. or 4 sacks of cement for 45

sq. ft. of surface, while for the one-course construction the same quantity produces about 47 sq. ft. of surface. Metal division plates or wooden partitions provide the most convenient means of dividing the forms to produce independent slabs. The metal plates are better because they can be kept in position a few hours, and then, if kept clean and well oiled, can be withdrawn without difficulty. The slabs are frequently laid alternately, as in Fig. 7, to secure positive division. In such cases heavy paper is inserted between the slabs previously and latterly placed.

The walk is by no means finished until the slabs have been cured. As soon as the surface is sufficiently hard to resist damage by a fine spray from a hose or sprinkling can, it should be wetted, and kept continually moist for four or five days at least. Failure to cure properly, and overtroweling, are the chief causes of "dusting," and the former often leads to definite loss in strength.

Some other faults in sidewalk construction are well illustrated by the photographs. In Fig. 3, the sidewalk was placed too close to a large tree, the roots of which raised the slab shown in the foreground. The sidewalk shown in Fig. 6 was a failure because of the use of poor, weak concrete, made of dirty materials, insufficient cement, and the poor bond between the base course and the surfacing. In Fig. 4 is shown the effect of a poor subgrade, which has sunk away on both sides, failing to support the walk properly, and causing a "broken back." The displacement of the curb, shown in Fig. 1, could have been avoided, had the slab been laid over the curb section, as shown in Fig. 8; the expansion of the slab would not then have damaged the curb. In Fig. 9, the subgrade of the walk has been undermined, and may cause eventual failure of the walk.

Shortening Rivets in Quantities

We needed some rivets, $\frac{1}{2}$ in. long and $\frac{1}{8}$ in. thick, but found that the stock of this size was exhausted. There was a large supply of longer rivets on hand, however, and rather than wait for a stock of rivets of the proper size, it was decided to cut down the long ones. A number of $\frac{1}{8}$ -in. holes were drilled in a $\frac{1}{2}$ -in. steel plate, and another and thinner steel plate of the same length and width was also provided. In use, the rivets were inserted in the holes in the drilled plate and the second plate placed over the

rivet heads. The assembly was then turned over and clamped in a vise, with the heads of the rivets down. A cold chisel was sharpened on one side only, and used to cut the rivet ends flush with the plate. In using this method, precaution should be taken to prevent injury from the flying ends.—Frank Jablecnik, Chicago, Ill.

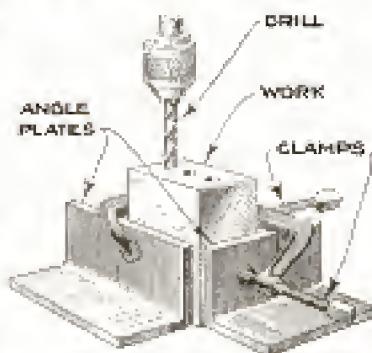
QUOTATION.—The average consumption of coal in steam boilers is 12 lb. per hour per sq. ft. of grate surface; there are 9 sq. ft. of heating surface to each square foot of grate surface.

Rocker Lever for Overhead Valves

Under the above title, on page 158 of our January, 1922, issue, we published a short article describing a tool for removing the tappet rods of an overhead-valve motor. We did not know at the time that this was patented; we have since been informed that it is, and our readers are therefore cautioned against making any tools similar to this.

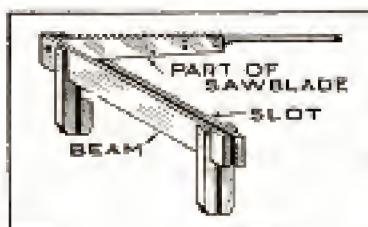
Clamping Work

Usually one angle plate is applied to clamp work held for drilling or other operations, with the result that, while the work is held square on one face, it may easily tip in the opposite direction. In fact, so readily will the work tip that the workman commonly uses a square to find whether or not it is true. All this takes time, and he has to tap the work with a hammer until he gets it just right. He then gives a final straightening twist to the clamp, and away the work slips again, not much perhaps, but enough to do considerable damage. With the use of two angle plates, all this is avoided, as the faces must be square with each other if the angle plates are square. The one clamp grips slightly lower than the other.



Header for Kafir Corn

One of the best things to use for the blade of a kafir-corn header is an old crosscut or one-man saw. The back of the saw is sharpened by grinding, and the blade is then mounted, back down, between two 2 by 6-in. pieces, these being held a sufficient distance apart by washers, to leave a slot for the blade. Four legs are provided on the ends of the header so that it may be placed over the edge of the wagon box.—R. E. Deering, Clements, Kan.



Portable Electric Testing Unit

An electrical testing unit consisting of four dry cells, with one test lamp, and two pointed terminals on flexible leads, is contained in a carrier made from an empty oil can and provided with a handle for carrying.

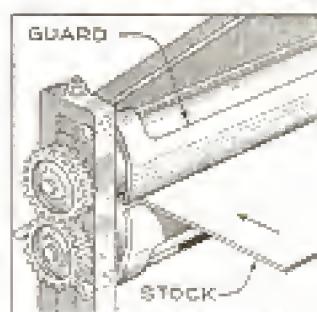
Two sides of the can are cut off level with the top of the battery and the remaining sides cut as shown. The test lamp is mounted inside, on a wooden block, to prevent breaking. The wooden handle, which can be made from an old broomstick, is fastened to the carrier by a screw at each end. Two holes are drilled through the handle, into which the terminals are inserted to keep them out of the way when the set is not in use, and to prevent short-circuiting of the battery.



Guarding Machine Rolls

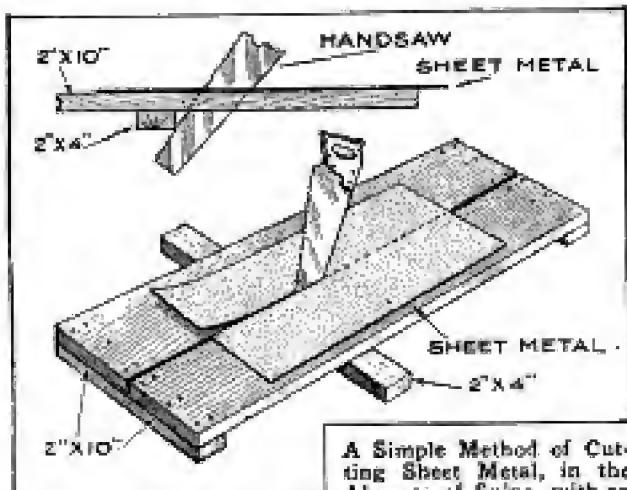
Any machine that uses rollers is dangerous, because it is so easy for the operator to get his hand in between the rolls. Generally the distance between the rolls varies according to the work going through them, and this fact in itself makes the problem of protection very difficult.

The drawing shows a simple scheme that has saved many a hand and finger. The two guards not only act as guards but guides as well; they are pivoted on studs, and open or close to suit the thickness of the stock being rolled. The bottom guard is held in an upright position by means of a spring, one end of which is fastened to the guard, while the other is fastened to the body of the machine. Both guards are provided with lugs, on one or both ends, which bear against some part of the machine, and prevent them from coming into contact with the rollers.—J. H. Moore, Toronto, Can.



Cutting Sheet Metal with a Handsaw

A simple method of cutting sheet-metal roofing with a handsaw—without injury to the latter can be used by carpenters and

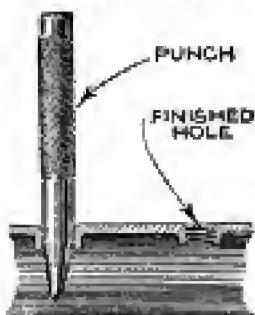


A Simple Method of Cutting Sheet Metal, in the Absence of Snips, with an Ordinary Handsaw: The Saw Cuts Cleanly and Quickly, and is Not Injured by the Process

others if a pair of snips is not available. Two planks are supported by horses at each end. A space just wide enough to permit insertion of the saw blade, is left between the planks. To cut the sheet metal, it is laid on the planks, the line along which the cut is to be made being directly over the space between the boards. The back edge of the saw is placed in the space, against the end of the metal. A piece of two by four is then placed against the underside of the planks and the toothed edge of the saw, as shown in the upper drawing. With the saw held in this manner, a backward pull on the handle starts the cut. This operation is repeated until the sheet has been cut across.—Irl R. Hicks, Centralia, Mo.

Tapped Holes in Thin Tubing

In making an overhead irrigation sprinkler, some of the pipes were found too thin to hold threads into which the



sprinkler jets could be screwed. The difficulty was overcome by using a center punch to make the holes, and to pull the metal into a long neck, which could then readily be tapped. In this manner the whole of the thin-walled pipe was made to take the sprinkler jets, without the delay that would have been caused in obtaining heavier pipe.—John Gormly, Norristown, Pa.

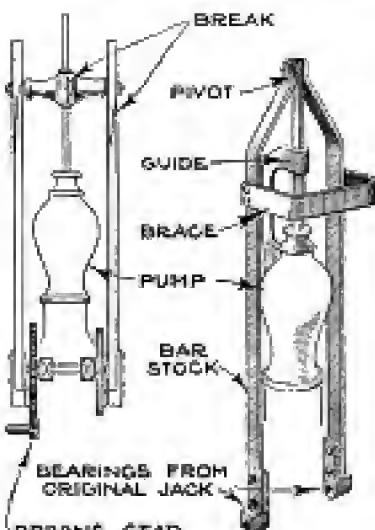
Silent-Chain Sprockets as Belt Pulleys

Small electrical generators for automobile use are almost invariably driven by silent chains running over sprockets. A fact not very generally known is that such a sprocket can be used without alteration to carry a belt when necessary for testing the generator, or even for regular operation on a car in emergency. Many mechanics would suppose that a flat belt would not stay on the sprocket, since it is not crowned like a belt pulley. A test will convince, however, that there is no danger of the belt coming off unless it slips or breaks. The greatest objection to running a belt on a silent-chain sprocket is that it is very hard on the belt and its coupling. The drive should therefore never be used except for a test or when a broken chain, which cannot be immediately replaced, makes the use of the belt necessary.—Curtis Ralston, Chicago, Ill.

Repairing Pump Jack for Engine Drive

A deep-well pump was fitted with a jack geared to a $1\frac{1}{2}$ -hp. engine, pumping water through a $1\frac{1}{4}$ -in. pipe against a 200-ft. head. The jack was of the ordinary commercial type, consisting of a cast-iron yoke through which the pump rod fitted and to which it was clamped, and two hardwood arms, drilled with a series of holes and bearing on crankpins on the gears. The yoke broke in the middle, causing the wooden arms to break also, but without damaging the pump rod, guide, or the cast-iron bearing boxes bolted to the lower ends of the wooden members. As it was thought that a new yoke of the same pattern would soon break also, a new rib consisting of two arms of $1\frac{1}{2}$ by $\frac{1}{2}$ -in. iron was made. The upper ends were bent inward to meet the pump rod, and were bolted to it with a bolt and locknuts, thus eliminating the yoke. The original cast-iron boxes were bolted to the lower ends of the iron arms.

When tried out, the arms were found to



bend outward, and to overcome this, an iron brace of $\frac{1}{2}$ by 2-in. stock was bolted across them. As the thrust on the brace was outward, $\frac{3}{16}$ -in. bolts were found large enough to hold it, although rivets could also have been used. The brace was offset enough to clear the pump-rod guide casting; its corners were forged round instead of square for additional strength.

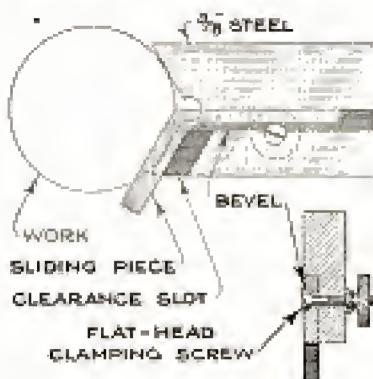
Gauge for Milling Hexagons

Those who have occasion to mill hexagonal shapes from round stock will find the gauge illustrated a valuable assistant. In order to avoid cutting one side too deeply and thus spoiling the work, it is usual to fall back on the cut-and-try method, whereby it may be necessary to revolve the work in the dividing head several times before a full hexagon is cut. The depth of cut can also, of course, be

figured out, but this method is avoided by many on account of the liability of errors creeping into the calculation. The body of the gauge is $\frac{3}{8}$ in. thick, with the end cut to a

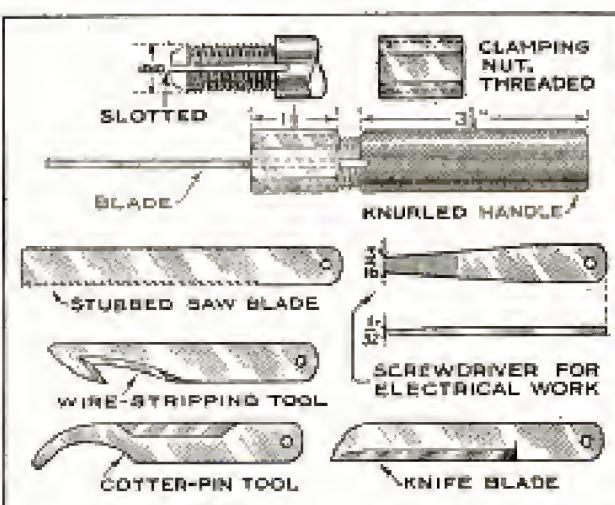
"V" of 120° , included angle, the center of which is filed away or a hole drilled to admit light. A slot is cut along the length of the body, one side of the slot being exactly in line with the center of the V. Next, a piece is made to slide in the slot with a 30° angle on the end, the angular portion fitting a clearance slot cut in the body. A slight bevel is filed on one side of the sliding piece, and a flat-head screw and knurled nut, used as shown, complete the device. To prevent the screw from turning when the nut is tightened, a flat is filed on the underside of the head, to fit against the bevel on the sliding piece.

To use the gauge, the sliding piece is pushed forward until the corner is in line with the edge of the shaft, as shown. The nut is then tightened, and a line is scribed on the work along the angular part of the sliding piece. This line is then clearly defined with punch marks, and the cutter set to split these in two. The work can then be milled to this depth on six sides, and a perfect hexagon, for the size of stock used, will result.



Handy Combination Tool

A handy combination tool that will find many uses in the hands of the automotive repairman or in the repair shop, is easily

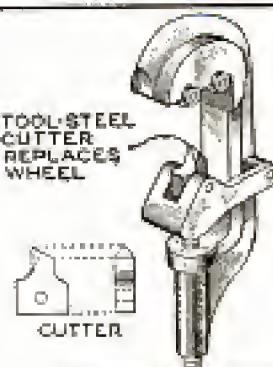


A Handy Toolholder and Outfit of Tools, Made from Pieces of Hacksaw Blades, That will Find Many Uses in the Hands of the Repairman and Auto Owner

made from a piece of round steel, about $\frac{7}{8}$ in. in diameter. One end of the stock is turned, threaded, the end beveled, and slotted to take the tools. A nut, with an interior bevel corresponding to that on the screw, is provided to screw over the threaded portion of the holder, so that, when in place and screwed tight, the tools will be firmly held. A set of tools for use in a holder of the type described may easily be made from pieces of hacksaw blades, a few suggestions being shown in the drawing. These, and others that will suggest themselves, can easily be shaped on a grinding wheel.

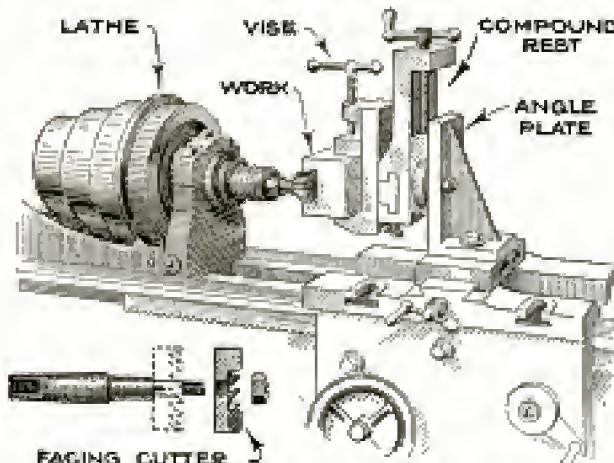
Improving the Pipe Cutter

A boiler maker found that boiler tubes cut off at the ends with the revolving-wheel type of pipe cutter cracked when the bead was being turned over. To overcome this difficulty, the movable wheel was removed, and for it a cutter similar to a lathe tool was substituted, with results that were entirely satisfactory. The cutter need not be turned down against the work so hard as is the case when the wheel cutter is used.—Irwin T. Fox, Richmond, Ind.



Lathe Used as Milling Machine

With the simple addition of a vertical feed to raise and lower the work, a lathe makes a first-class milling machine. There are various attachments manufactured for this purpose, but all that is necessary



Compound Slide Rest, Mounted on an Angle Plate, Converts the Lathe into a Milling Machine. The Work is Held in a Tool Vise, and Standard Milling Cutters are Mounted on a Taper-Turned Arbor, Fitting into Headstock Spindle.

for a small lathe is an angle plate to change the compound slide from the horizontal to the perpendicular. This angle plate, faced on both sides, has holes drilled in it to match the circular groove in the compound swivel. The toolpost slot may be used to hold the work by tapping the casting to receive setscrews. A small tool vise can be clamped to the toolrest, or if a clamping table is preferred, it may be used in the same manner. The attachment is universal, as the plate may be swiveled on the carriage or the compound slide may be swiveled on the plate, to give any desired angle. The cutters are carried on a taper-turned arbor, fitting the lathe spindle. If heavy cutting is to be done, this arbor should be tapped to receive a long stud, passing through the headstock spindle, whereby the arbor can be drawn up tightly. Standard facing, side, or end-milling cutters may be used.—Edwin J. Bachman, Fullerton, Pa.

Creosoted-Wood Silos

Wood-preservation studies have shown that the value of wood silos can be greatly increased by proper treatment with coal-tar creosote. A good creosote treatment will not only increase the durability of the wood, but will reduce the tendency of the staves to shrink when the silo is empty. A creosoted silo cannot be painted afterward; however, it does not need

painting, for the creosote protects the wood, and its color is very pleasing. Highly durable woods, such as heart cypress or redwood, do not need protection against decay so much as the nondurable woods, but a thorough creosote treatment will make the nondurable woods, such as sap pine, last longer than durable species will without treatment.

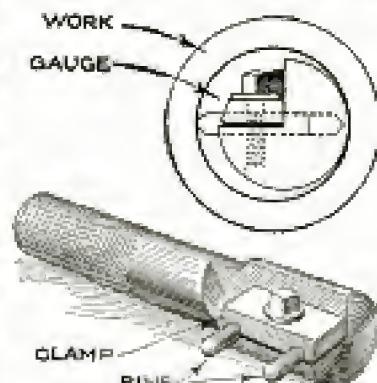
Contamination of the silage by creosote from the staves need not be feared. This is borne out by experiments and inquiry among the many farmers who have used creosoted silos. In order to be quite sure, it is well to allow the creosoted staves, or the finished silo, to stand a few weeks before filling.

The most thorough creosote treatment can be given by pressure methods. If pressure-treated wood is not available, very good results will be obtained by the hot and cold-bath treatment. If a good penetration of coal-tar creosote is obtained by either of these processes, it is not too much to expect the silo staves to resist decay for from 25 to 30 years.

A Simple Internal Gauge

When used on collars or other work of short length, the adjustable internal gauge illustrated will easily take the place of a number of solid plug gauges. The minimum diameter of the one shown is 1 in., this being the size to which the head is finished. Two $\frac{1}{16}$ -in. holes are first drilled and reamed in the side to take round-ended pins. Next, a quadrant is milled out as shown, and a clamping plate, with two grooves to fit over the pins, is made. A hole is drilled and tapped in the gauge, between the two pin holes, and a square-headed collar screw, that passes through a hole in the clamp, completes the assembly. The first pin is used for the low-limit setting, and the second for the high, the pins being set by measuring over all with a micrometer.

When setting, it is convenient to have the clamp tightened on the pins just enough to hold them in place; then the micrometer can be brought down to the size required, pushing the pin in at the same time.

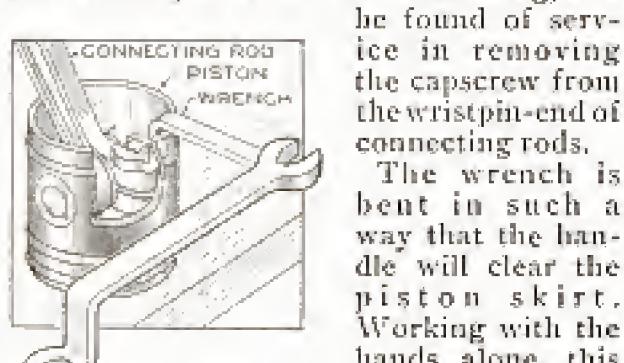


Veterinary Capsules for Small Parts

Empty veterinary capsules make excellent receptacles for holding very small parts and pieces in such a manner that the quantity and condition of the contents can be told at any time, as the capsules are transparent, and, unlike glass, practically unbreakable. Used in series, the capsules, which can be obtained in different sizes, can be used to hold beads, paint or bronze colors, pins, tiny buttons, small screws, graphite, or leads. These capsules, being made of gelatin, must not be allowed to become wet. A simple rack for holding such receptacles in either a horizontal or perpendicular position can easily be made.—C. Nye, New York City.

Connecting-Rod Wrench

An offset made on the end of an open-end wrench, as shown in the drawing, will be found of service in removing the capscrew from the wristpin-end of connecting rods.



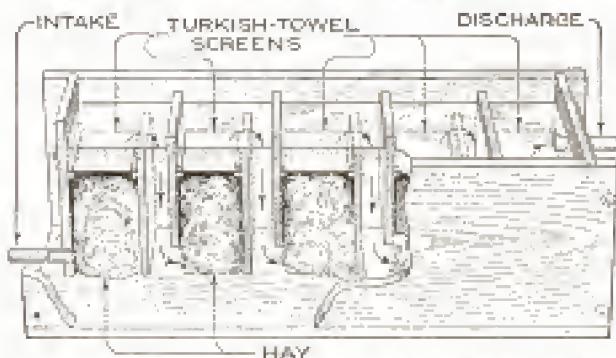
This tool makes it possible to take out or replace the capscrew without requiring any clamping arrangement to prevent the piston from turning.

A Feed-Water Filter

A rather novel filter, made from Turkish towels and marsh hay, was used in connection with the Dayton river-channel improvement work, for removing sediment from the river water in order to have available at all times an adequate supply of clear water for the steamboat boilers.

The construction of the filter is clearly shown in the drawing. It consists primarily of a long rectangular wooden tank, divided into compartments by partitions, through which the feed water is caused to circulate, entering at one end and leaving at the other and passing through consecutive filters of hay and toweling in the course of its journey. The water enters, yellow or brown with unsettled river mud, and leaves ready to enter the boilers, clear enough to drink.

Five compartments are shown in the drawing, but a greater or smaller number may be used, depending on the amount of sediment to be removed. The compartments are separated by double baffle boards set about 3 in. apart, the water



A Simple Filter for Removing Mud from River Water, to Provide Clear Water for Steamboat Boilers. Uses Hay and Turkish Toweling as Filtering Materials

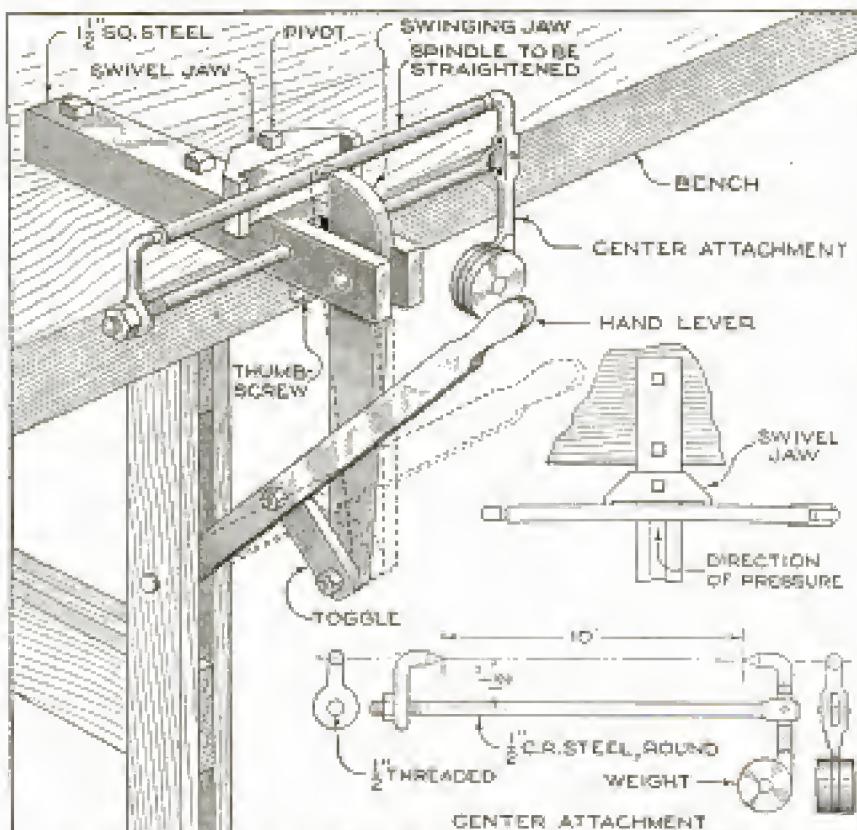
passing, in all cases, over the top of the one nearest the inlet and under the bottom of the next, thus always entering a compartment at the bottom and passing upward through the filter. Each compartment is filled with hay to the level of the cross cleats near the top. Finer screens, made by tacking Turkish toweling onto rectangular frames, are placed on top of the hay and held in place by the cross cleats. The water passing through the compartments, always in an upward direction, leaves its burden of sediment in the hay and under the toweling, thus preventing the rapid clogging of the filter which would result if the water passed downward. With this arrangement, it was necessary to clean the filter only twice a week—a very simple operation, consisting in removing the towels, washing them with a hose and replacing them. It was not found necessary to remove the hay except at long intervals. The simplicity and efficiency of the device, which can easily be built by any carpenter, adapt it to many different situations. It must be remembered, however, that it is for sediment only; lime and other soluble ingredients are, of course, not removed.—Ivan E. Houk, City Engineer, Dayton, Ohio.

Painting on Old Walls

Old walls, especially of kitchens, have a thin layer of grease and smoke upon them that may not be perceptible, but which will prevent paint from adhering properly. Before being repainted, they should be washed thoroughly with soap and water, to which a little ammonia may be added, and finally rinsed with water.

Spindle-Straightening Fixture

Often, in the course of the manufacture of articles of standard design, small shafts or spindles are used; these are



For Straightening Light Shafts or Spindles, in Quantity, a Fixture of This Type Has Much to Commend It. The Centers Holding the Work Are Adjustable Horizontally So That Any Part of the Work can be Reached

usually made from a good grade of tool steel, centered and turned to the form required. After centering a great quantity of such spindles on small turret lathes, it was found, after they had been cut off, that quite a few had been cut from stock that had been slightly bent, and while they would run fairly well at the ends, due to close chucking, the center would run out so badly that they would not clean up on the machining cuts. It was decided that the common method of straightening the stock would be too slow and unprofitable, and the fixture shown in the drawing was made. The body of the device is made of square steel and is bolted to a bench so that the slotted end projects over the edge. A $\frac{1}{2}$ -in. slot, cut in one end, receives a movable swinging jaw. Mounted on the top side of the base is a swivel jaw having two extending lugs, the metal between them having been removed on a shaper; this block is fastened loosely to the base by a $\frac{5}{8}$ -in. capscrew. A $\frac{1}{2}$ -in. hole is drilled and reamed horizontally through the iron base, just behind the slot, to

take the centering attachment upon which the work to be straightened is supported.

The centering attachment is made from a piece of steel rod, which is flattened at one end and threaded at the other. On the threaded end is screwed a stationary center, which is held tightly by a locknut. A swinging center is pivoted to the flat end of the rod, thus permitting quick positioning of the work between the centers. Also, the weighted end of the swinging center keeps it pressed against the end of the work, and keeps the centering fixture normally in a vertical position.

When the operator has placed a spindle between the centers, he will first revolve it with his fingers, and, by sighting, detect the point at which the work runs out. He now brings the high spot toward himself and by pressing down on the toggle handle, exerts pressure against the work, bending it in the opposite direction. The work is again tested, and the operation repeated as may be necessary.

Stripping Films from Cracked Negatives

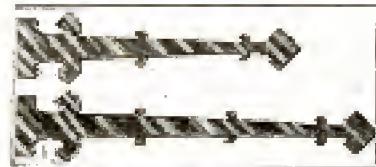
To strip the film from cracked glass photographic negatives, so that the film can be placed on another piece of glass and prints made from it in the regular manner, the film is first hardened in a three-per-cent solution of chrome alum, washed for five minutes, and then dried. Next, a 20-per-cent solution of white gelatin is made and filtered while hot. A liberal quantity of this is poured over the negative, which has previously been warmed and placed as level as possible. When the gelatin has hardened, the negative is again placed in the chrome-alum solution, washed for five minutes, and placed in denatured alcohol for a half hour, after which it is dried again.

To strip the negative from the glass, use a mixture of 2 oz. water, 1 oz. denatured alcohol, and 1 dr. of commercial hydrofluoric acid. After a few minutes' immersion in this bath the film can be

loosened around the edges with a small stick of wood, cut to a chisel point. When this stage is reached, the negative is transferred to a tray of clean water for a minute or two and then to another; the actual stripping is done in the latter tray, by means of the stick. After removing the film, it is washed in two or three changes of clean water, then laid out smoothly on a ferrotypic plate to dry. The fingers should not be allowed to touch the hydrofluoric-acid solution, which is very corrosive and poisonous. Usually it is not advisable to place the film on glass, as there is considerable risk of distortion in drying, but, if necessary, it can be done. A good method is to fix out an unexposed plate, and harden in formalin the layer of clean gelatin left. This is slipped underneath the stripped film while the latter is lying in water. The plate is then raised until the film rests on the glass securely. Finally, it is drained and allowed to dry in contact with the gelatin.

Cutting Torch Produces Ornamental Ironwork

What can be done in the way of producing ornamental hinges from sheet metal with an oxy-acetylene cutting torch is clearly shown in the photograph.



The intense heat developed makes it possible to cut the metal as easily as wood is cut with a hand saw. Practically any metal can be worked by this means, the hinges shown having been cut from bronze.—Harold C. Ridgely, New York City.

Balancing Polishing Wheels

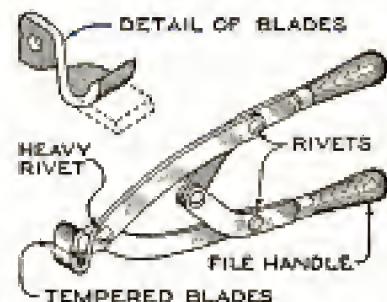
It is highly important that polishing wheels be in balance. Balancing ways are made for this special purpose, and the balancing itself is usually done by nailing pieces of sheet lead on the light side of the wheel, until the wheel remains at rest in any position on the ways. It is also important that the wheel run absolutely true. The wheel is not necessarily true, however, even if in balance. By the use of an old file or buff stick, supported by a temporary rest, the wheel can be made to run so that every portion of its circumference will come in contact with the work.

Scaffold That need Not be Fastened to Building

When reshingling or repairing a building, it is quite necessary to have a scaffold to work from, as a ladder does not give the proper freedom of movement or stability for the worker, and, unlike new construction, it is not usually possible to nail blocking to the sides of the house for supports. The drawing shows how a scaffold can be erected without marring the surface of the building, and yet be substantial enough for all work. A piece of 2 by 4 or 2 by 6-in. stuff is placed at an angle to the building, and as close up under the eaves as possible, as this saves side bracing. Another piece is placed in a vertical position, and crossing the first, and the two are spiked together where they cross. This is done at each end of the building, and in the middle if necessary; then short pieces of similar lumber are nailed across the long pieces to form supports for the staging.

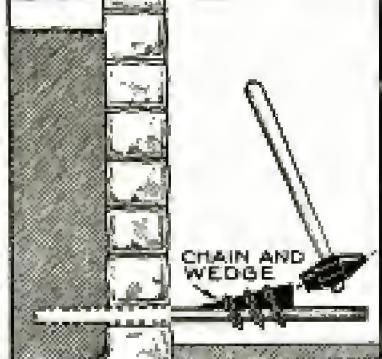
A Small Bolt Cutter

Sawing off the ends of bolts is slow and tedious work, and it is not always possible to use the hacksaw, because space is lacking. The drawing shows a clipper that can be made from two flat files, the arrangement being such that a powerful leverage is obtained. Four 12-in. files are used, their ends being annealed so that they may be drilled and the cutting lips forged. When assembled with bolts or rivets, two ordinary file handles are fitted to the tangs of the files forming the handles. The cutting edges should be tempered to the same hardness as that generally used for lathe tools, that is, to a light-yellow color.



Driving Pipe Underground

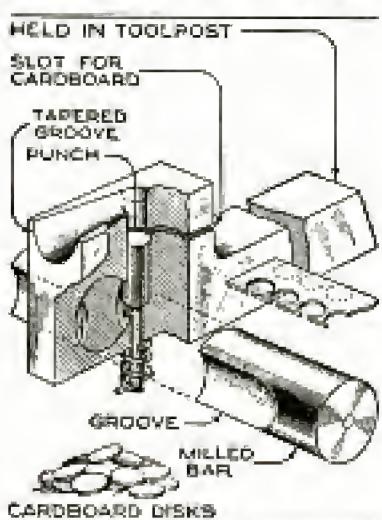
It is often possible, when laying iron pipe of small diameter, to drive the pipe through the earth and save the cost and trouble of digging a trench, with the aid of a specially constructed point, something after the style of a well point. One trouble that is common to this method is



that the outer end of the pipe must be protected against the blows of the hammer or maul used. Wooden blocks offer slight protection and damage to the threads is likely to result in spite of them. A much better method is to use a steel wedge secured to the pipe by a length of chain in the manner shown. The blows of the hammer on the wedge tighten the chain and afford sufficient grip, and the heaviest blow will not damage the pipe.

Punching in the Lathe

The drawing shows a rather novel fixture used for cutting cardboard disks in a lathe. There are three main parts, the punchholder, punch, and operating shaft. The holder is made of any convenient size, to the shape shown, the back end fitting in the toolpost. Near the front, a hole is bored to take the milled bar that operates the punch, and tangent to this hole a small hole is drilled from top to



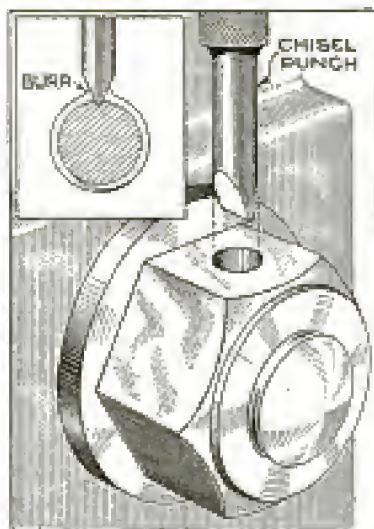
bottom. This is counterbored, the size of the punch to be used, down to the center of the larger hole, and a tapered groove is milled from the counterbore to the front of the holder, on the top face. The punch is made to fit the counterbored hole, as shown, and fitted with a coil spring, washer, and pin, to keep it down on its seat. A narrow slot is

cut in the top of the holder, in the position shown, to take the cardboard from which the disks are cut. The operating shaft is a bar, centered at both ends and having semicircular grooves milled on opposite sides.

In use, the holder is gripped in the toolpost, with the shaft held between centers and driven by a dog. The lathe is run backward, and the stock fed by hand; at each revolution the punch cuts two disks, which are forced out of the hole, and slide down the tapered groove into a box.

A Simple Locknut

The drawing shows one of the simplest forms of locknut, that will stay in place without loosening until forcibly removed with a wrench. A $\frac{3}{16}$ -in. or larger hole, the size varying with the size of the nut used, is drilled through the side of the nut. After the nut has been tightened, a nick is cut across the bolt thread, using a small chisel punch as shown.



The hole serves a double purpose, as it permits insertion of the punch and forms a cavity for the upraised burr, which prevents the nut from turning. Naturally, to be the most effective, the cutting edge of the chisel should be held parallel to the axis of the bolt when raising the burrs.

Grinding Troubles

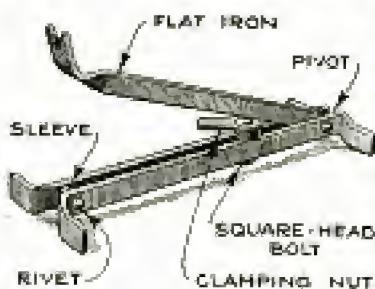
If the wheel glazes, the work is burned or the wheel cuts slowly, the remedies are, for the first, to use a coarser wheel; for the second, to use a softer wheel, and for the last, to decrease the table speed or increase the feed. If the wheel wears too fast, increase the table speed or decrease the feed; if this has no effect, try either a harder or a finer wheel. For a finish that is too rough use a finer wheel, or, in some cases, an elastic wheel; or, these remedies failing, try a little cutting oil in the grinding solution, if only soda water is being used.

Formula for Breaking Strength of Rope

For three-strand Manila rope with a regular lay, and from $\frac{1}{2}$ to $4\frac{1}{2}$ in. in diameter, the following computation will give the strength of the cordage: The average breaking strength in pounds equals 5,000 multiplied by the diameter of the rope in inches, and the product then multiplied by the diameter in inches increased by one. Thus, in calculating the strength of a 3-in. rope, multiply 5,000 by 3, the diameter in inches, and then multiply the product by 4, which is the diameter of the rope increased by one, the total product being 60,000 lb. This method gives the average maximum weight that the rope will hold, but the working load must, of course, be much less.

Adjustable Stock Support

For a small shop, the handy stock support illustrated will be found much more useful than the usual telescopic arrangement, since it can be used to support bars very close to the floor, as in fitting a shaft to the finished machine, or high up for pipe-threading machines and work in the vise. It is made of $\frac{3}{4}$ by $1\frac{1}{2}$ -in. flat stock. Two pieces of stock form the base. These should first of all be dropped

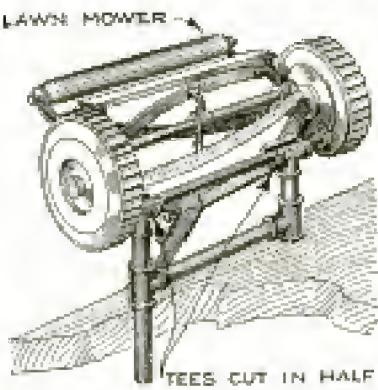


at the ends enough to clear a bolt head, then bent at right angles to form feet. The lever support is twisted at right angles at one end, bent upward a little,

and a "V" cut. The opposite end is drilled for the pin on which it pivots, and which, being riveted at both ends, binds the three pieces together; a similar pin, with a sleeve, is used at the other end. An ordinary square-headed $\frac{3}{4}$ -in. bolt slides between the two members forming the base, the top of the square on the bolt being filed a little on the sides to allow it to enter the channel and prevent it from turning. A special clamping nut is shown, which, of course, is convenient, but an ordinary nut will serve the purpose if the cost is to be considered. Made to a length of about 3 ft., this support has a range from that height to 6 in. from the floor. The bars held in this support must be fed or pulled forward so that the pressure is kept on the bolt, that is, away from the pivot.

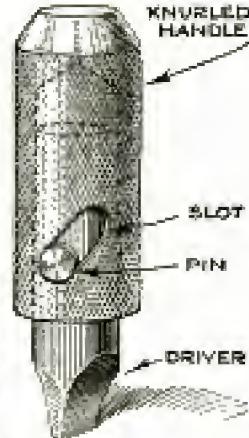
Fixture for Lawn-Mower Repairs

The drawing shows a fixture that has been in use for several years in a shop making a specialty of lawn-mower repairs. It is made from short lengths of pipe and suitable fittings. The distance between the two half-tees is such that a lawn mower of any width can be placed in the fixture and held firmly. The projecting pipe ends of the fixture fit into holes drilled near the edge of the workbench, so that it can be removed when not in use. The lawn mower is supported in the fixture by the stay rod, as shown, with the handle resting on the floor.—A. W. Zimmerman, Chicago, Ill.



Removing Tight Screws

Screws of the slotted-head variety are, at times, very difficult to loosen, especially if they have remained undisturbed for a long time in a damp place. The little tool shown in the drawing will aid in loosening such screws without destroying the slot, as any attempt to hammer them off will do, thus making the job more difficult. A short piece of $\frac{3}{16}$ -in. stock is drilled up the center with a $\frac{1}{16}$ -in. drill, knurled on the outside, and an angular slot, $\frac{3}{8}$ in. wide, and running into the $\frac{3}{16}$ -in. hole, is cut in the side. The driver is made of $\frac{3}{16}$ -in. tool steel, drilled for a $\frac{1}{8}$ -in. pin, which is driven in when the two parts are assembled. With the pin at the bottom of the angular slot, the tool is grasped firmly in one hand and placed in the screw slot. The top is then lightly tapped with a hammer, which, while keeping the blade in the slot, at the same time continually presses it round in a left-hand direction, so as to loosen the screw. Only light taps of the hammer should be used, as heavier blows will not produce the desired effect.



Unwrapping Wire in the Lathe

HERE are occasions when it is necessary to remove the insulation from magnet or annunciator wire, as when triple-covered wire is to be reduced to double, to save winding space, or when the paraffined outer layer of annunciator wire

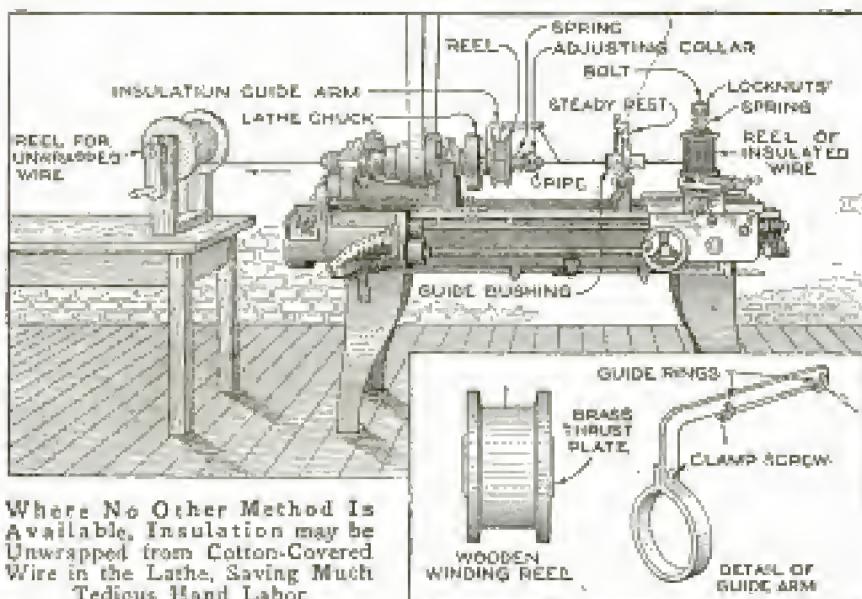
In use, enough of the wire is stripped by hand to allow the unwrapped portion to be passed through the spindle and attached to the spool at the rear, and the cotton threads are carried through the guide arm and attached to the spool on the tube, the spring being so adjusted as to allow the spool to turn stiffly, yet without pulling the wire badly out of line or breaking the strands. It can be seen that, as the wire is drawn along, the insulation will unwind from it, pass through the guides on the rotating arm and wind itself on the spool. As the rate of winding on the spool will be much less than that at which the strand is unwound from the wire, there will be considerable slippage between the spool, thrust washers, and tube, the

spool being pulled around by the insulation. The success of the operation will depend upon the spring adjustment and the rate at which the wire is drawn along. An adjustment that is too loose will prevent the winding of the insulation upon the spool, while one that is too tight will pull the wire out of alignment and possibly break the strand being unwound.

By reversing the process, it is possible to wrap bare wire, but a smooth job would hardly result. For special purposes, however, such as wrapping thermocouple resistance wires with asbestos string, the method should be successful.

For a short lead, the end of the wire could be attached to a bolt clamped to the tool block in place of the spool; then the carriage would be started moving toward the end of the bed, drawing the wire through the headstock spindle and at the same time applying the wrapping. Here a good deal would depend upon giving the carriage the proper rate of feed. Two, three, or more, layers of insulation could be wrapped or unwrapped, but only one at a time, the wire being run back and started through each time another layer was to be worked upon.

To drill horizontal holes accurately with a ratchet drill, make the punch mark deep, and apply sufficient pressure to the drill to prevent its tendency to slip down.



is to be removed to convert it into single cotton-covered magnet wire. This is an extremely tedious operation when done by hand, particularly when the wire is of any length.

The drawing illustrates a lathe set-up designed to unwrap the insulation mechanically. The insulated wire is carried on a reel, or spool, held on a bolt clamped to the compound rest. A metal thrust washer, a spring, and two locknuts on the end of the bolt, hold the spool by friction and prevent it from being too easily turned. The wire is carried along above the lathe bed through a sleeve held in the steady rest and through the headstock spindle to another spool, arranged with wooden bearings and a hand crank, and mounted on a bench or stand beyond the lathe. A piece of brass or iron pipe is held in the universal lathe chuck; fastened over the chuck jaws is a clamp made of bar iron having its end turned over at right angles, to form a guide for the insulation stripped from the wire, two guide rings being provided for this purpose. Next, a brass thrust washer or plate is placed on the pipe, and then a hardwood spool, upon which the insulation is wound as it is unwrapped from the wire. Another thrust washer is placed in front of the spool, then a compression spring and an adjustable collar to hold it in place.

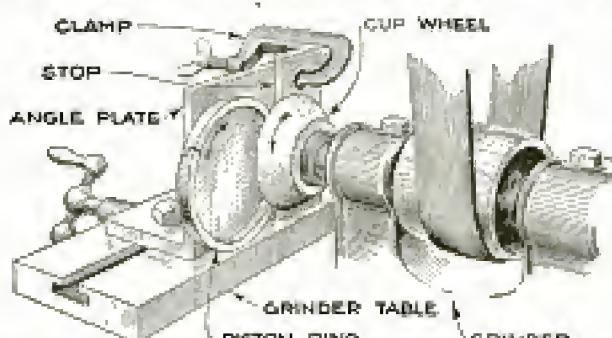
Extension for Cold Chisel

There are times when the only method to loosen a nut with the tools at hand is to set a chisel against one of the corners and strike it with a hammer. However, sometimes nuts are so located that the chisel is not long enough to reach them. In such cases, an extension can easily be made for the chisel by driving a sleeve, of pipe or tubing, over the head of the chisel, and inserting a piece of rod, the size of the chisel shank, into the upper end of the sleeve.

Grinding Piston Rings

In the small jobbing shop there is often a call for special piston rings to fit odd-sized bores of steam and gas-engine cylinders. To get an accurate fit in the ring groove, the sides of the ring must be ground or filed off; this usually difficult job can readily be done on the shop's universal tool grinder.

An angle plate is mounted on the table of the grinder, parallel with the face of a cup wheel, as illustrated. A piece of flat steel is clamped against the angle plate and serves as a stop, against which the outer surface of the ring rotates. The

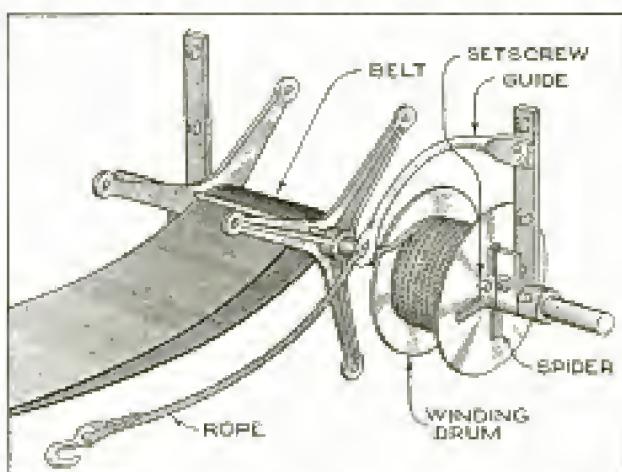


A Simple Method of Grinding Odd-Sized Piston Rings to the Proper Width on a Universal Tool Grinder Solves Another of the Problems of the Jobbing-Shop Mechanic

ring rests and revolves on the table slide. When the rings are cut off the ring "pot" on the lathe, one side is faced carefully and made straight and true. This face is then brought against the vertical face of the angle plate, with the opposite face against the grinding wheel. Rotation of the ring is effected by slowly turning by hand, the wheel producing a pulling effect on the ring in a downward direction. When one side is finished smoothly, the ring is reversed and the opposite side touched up and ground to the exact width of the groove, less about .0015 in. This trick can be applied to many other similar jobs, and, with a little care, good work is easily done.

Winding the Thresher Belt by Power

One of the hard jobs of the thresherman is the winding up of his long drive belt, and a device that reduces the manual



A Simple Attachment for the Grain Separator That Lightens the Labor of the Thresherman by Winding His Long Drive Belt on a Reel—the Tractor Does the Heavy Work

effort required to do this will be appreciated generally.

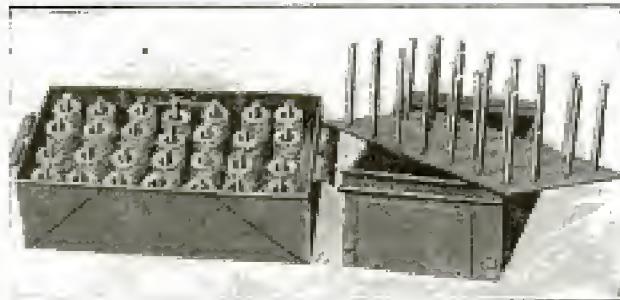
The arrangement shown in the drawing made it possible for one farmer to use power for the purpose of winding the belt on the reel usually provided for that purpose. A winding drum was made from a section of a maple log and fitted with two 20-in. sheet-metal flanges. This drum was fastened to the shaft on which the reel was fitted by a spider, which was originally the hub from the fan of an old separator. A 60-ft. length of $\frac{1}{2}$ -in. rope, with a loop at one end and a hook at the other, was then prepared. The looped end of the rope was dropped over a pin driven into the face of the drum, so that when the rope had been unwound, it would slip off. An arm, with a hole in the lower end, was attached to the frame of the separator to act as a guide for the rope when rewinding.

To operate the device, the tractor is driven to the separator as for hitching, but only the hook on the rope is attached to the drawbar. The belt is then fastened to the reel and the tractor is driven away. The pull on the rope wound around the drum serves to wind the belt in its place. When the belt is to be unwound again, the rope is attached to the drum and thus, as the belt reels off, the rope is wound up for repeated service.

Mercury boils at 676° F., and at that and higher temperatures it vaporizes rapidly, though mercurial vapors will rise from the metal at a lower temperature.

Rack for Steel Stock Boxes

Every factory uses standard steel stock or "tote" boxes, to carry from one operation to another materials and parts being worked upon in the shops. Usually, there are many different kinds and sizes of parts that must be accommodated, and with a variety of production, it is not advisable



A Rack for Steel Stock Boxes That Makes Possible Rapid Counting of the Parts, and Also Prevents Them from being Damaged

to equip the stock boxes to handle only one particular piece permanently. Flexibility must be secured, and this is accomplished by a large manufacturer of lighting plants as illustrated.

A steel plate, $\frac{1}{4}$ in. thick, is cut enough smaller than the inside dimensions of the steel box so that it will drop in easily. It is drilled with a suitable number of holes, depending upon the number of spindles that is desired in the box. This number will depend on the size of the parts to be placed on the spindles and the clearance necessary between the parts. Enough space should be left between the spindles so that a variety of objects of approximately the same size can be accommodated, without danger of rubbing or damage. The spindles may be iron pipe, of any suitable size, although $\frac{3}{8}$ -in. pipe usually provides sufficient strength. They should be threaded for about $\frac{5}{8}$ in. on one end, and the holes in the plate tapped to suit. After the spindles are screwed into the plate, a pair of thin lock-nuts are screwed on the projecting ends of the spindles and lightly riveted over. This provides a strong, sturdy, adaptable rack that can easily be placed in an empty box. It also allows quick counting, as anyone can tell at a glance if all the spindles are full and how many parts are missing.—Edward H. Tingley, Dayton, Ohio.

QAn arrow cut on the feed pawl of a shaper will save time and confusion, by indicating the direction in which the machine will feed for each position of the pawl.

Finishing Wooden Patterns

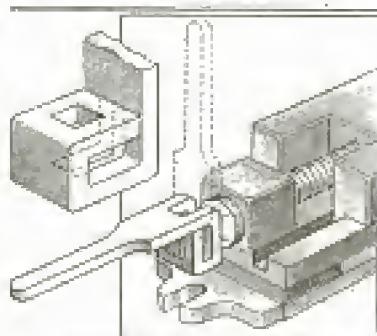
In making wooden patterns, the most tedious part of the work is the sandpapering between the several coats of shellac, and, also, applying the beeswax fillet. Little or no sandpapering need be done, yet a high gloss with but one coat of shellac obtained, if the pattern is first completely covered with melted beeswax. This may be applied with a hot iron held against a cake of the wax, which, as it melts can also be guided into the places to be filleted. Care must be taken not to have the iron so hot as to scorch the glue at the joints. Little wooden chisels and round-end tools are used to scrape off the surplus wax, and to groove out the fillets, the wax chips being kept brushed away with a small brush. One coat of the varnish will dry with a high gloss, and the pattern will be entirely moisture-proof and ready for the foundry. This method will be found particularly useful with patterns of irregular contour.

Combination Box and End Wrench

A novel and cheaply made wrench, designed for saving time when used on a milling-machine vise, does the work of an open-end wrench and a box wrench. All operators of milling machines know that when the vise is bolted to the table, with the jaws at right angles to the travel of the table, the regular wrench can only be given half a turn at a time, when opening or closing the vise, as it strikes the table. To save a little time some use an open-end wrench to bring the jaws up to the work. If special jaws are being used on irregular work, the vise may require several turns of the screw to open or close it.

The wrench illustrated is made from $\frac{3}{4}$ by $1\frac{1}{8}$ -in. stock, forged into the shape shown. The bent-back portion has a square hole in it to fit the square of the vise screw. The front and adjacent side are also slotted to fit the square. The remainder of the stock is finished as desired, to form a handle grip.

When opening or closing the vise, the wrench is used as shown by the solid lines, but when greater pressure is re-



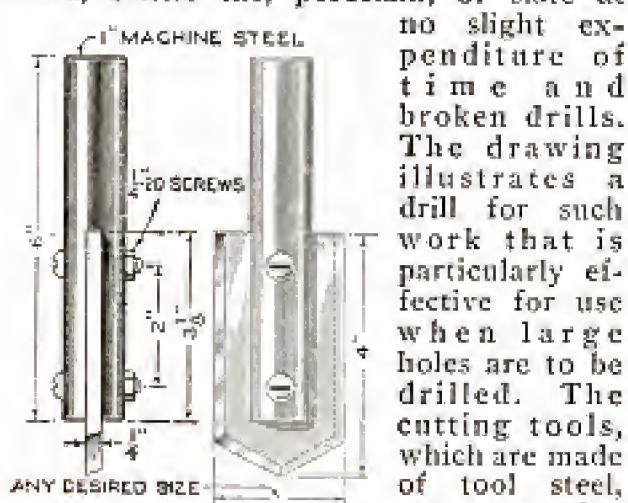
quired to loosen or tighten, the wrench is slipped back until the square hole is off the square on the vise handle; it is then swung around and pushed down until the end of the slot rests on the vise-handle square, and the handle of the wrench is in a perpendicular position, as indicated by the dotted lines. The wrench is then used as an open-end wrench.

Writing White on Blueprints

White ink, water color, or a strong solution of baking soda, are generally used for writing on blueprints when extra details are to be added and it is not desirable to make new prints from the corrected tracing. A fine permanent white line may be made by dissolving a small lump of unslaked lime in water and using this liquid as one would ink. The lime water does not work like whitewash, but, like baking soda, acts on the blue ground chemically.

Drill for Slate or Marble

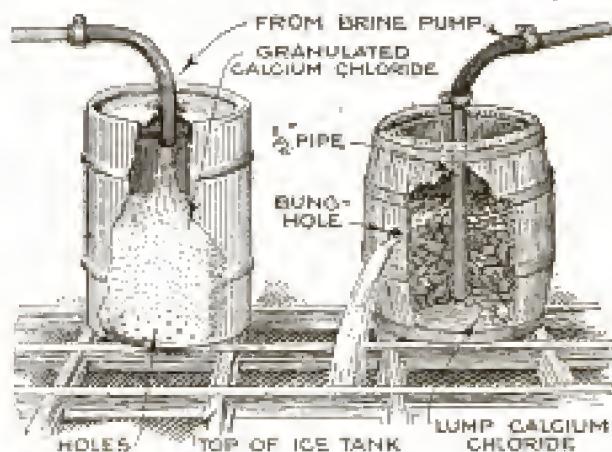
Tile setters, plumbers, electricians, and others must frequently drill holes through hard, brittle tile, porcelain, or slate at no slight expenditure of time and broken drills.



The drawing illustrates a drill for such work that is particularly effective for use when large holes are to be drilled. The cutting tools, which are made of tool steel, are removable for sharpening, and can be made for holes of different diameters. The edges are milled off at an angle of about 45°, or enough for good clearance, and the lips are sharpened in about the same manner as an ordinary flat drill, the sides also being sharpened. When a hole is to be drilled with this type of tool, a guide hole is necessary to allow the dust to fall through. Very slow speeds are essential to successful drilling in slate, marble, and similar materials. The drills will not work as well at high speed as at slow speed because of the excessive friction.—Arthur F. Cox, Chicago, Ill.

Dissolving Calcium Chloride

When mixing the brine solution for refrigeration plants, calcium chloride is dissolved in water, and many hours of



Methods of Dissolving Granular or Lump Calcium, One of the Chemicals Used in the Brine Solutions of Refrigerating Installations, without Manual Labor, the Brine-Circulating Equipment Doing the Work

back-breaking work can be saved if the machinery of the plant is made to do the work mechanically. The usual method of mixing the solution is to stir the chemical in a tub or barrel until dissolved and then dump it into the tank, and repeat.

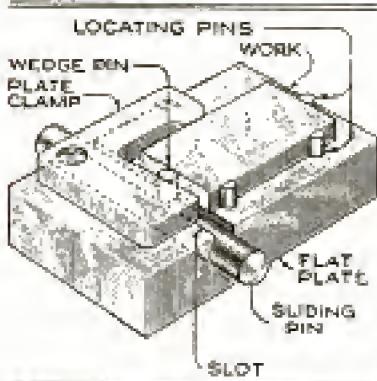
The drawing shows two systems, depending upon whether the granular or lump chemical is used. If the calcium chloride is granular, punch a number of holes through the bottom of the drum with a chisel and cut an opening in the head large enough for the insertion of a hose. Then roll the drum over on the tank top, remove about six ice cans, and set it up over the opening. Connect with the brine-circulating pump, and run the brine or water through the granulated chemical, which will dissolve in a very short time, leaving the drum empty.

When dissolving the chemical in lump form, take a barrel, set it up over the tank in the same way as before, and connect a length of $\frac{1}{2}$ -in. pipe to the brine-circulating system; dump in the lump calcium and turn on the brine. The liquid will enter at the bottom of the barrel, and on rising, will pass through the chemical and through the bunghole into the tank below. In this manner the only manual labor connected with the operation is to fill the barrel occasionally with the undissolved chemical.

Q Engines running under widely fluctuating loads should be provided with a speed-limiting device which acts independent of the governor. *Copyrighted material*

Rapid Jig Clamp

Drilling flat plates of square or rectangular shape is a common shop operation, and simple jigs are, as a rule, used to hold the work, more especially if there are any number of pieces of approximately the same size to be drilled. Such jigs generally take the form of a flat plate fitted with bushings for the necessary holes, the work itself being located against flattened pins and held by two screws at



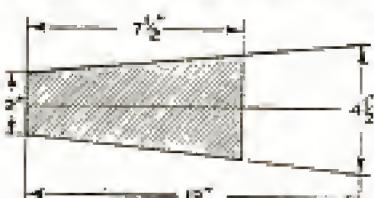
right angles to each other. For work of accurate dimensions, the double-plate clamp shown is much to be preferred to the screws, as the work is gripped or released by a

single movement. The clamp is made of flat stock, which should be slightly thinner than the work, cut to the shape shown, and drilled and counterbored for a round-headed screw. Through the side of the jig body a hole is drilled for a sliding pin, which has driven in its center another pin; the latter forming a wedge that slides between the work and the taper side of the clamp. The hole for the sliding pin should be drilled as close to the top as possible and a slot cut through afterward to clear the wedge pin.

In use, the work is laid in place, and the sliding pin is tapped on the end with a light hammer. This forces the wedge pin between the end of the work and the taper of the clamp; this has the effect, as will be seen, of tightening the work from both sides at the same time. A tap on the opposite end of the sliding pin, of course, releases the work.

Laying Out Tapered Work

The work required to lay out tapered work by the methods generally used involves considerable calculation, and an easier method will be appreciated by the draftsman. For example, supposing it is desired to lay out a piece to be turned on the lathe, $7\frac{1}{2}$ in.



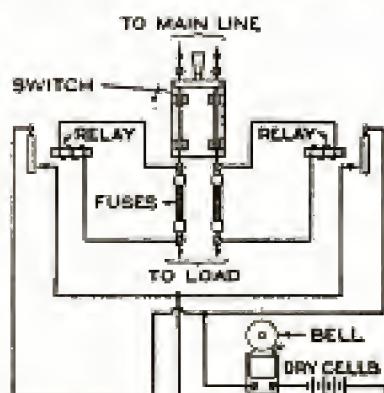
and with a taper of $2\frac{1}{2}$ in. to the foot. Proceed as follows: Lay out the center line, and mark off, on this line, a distance of 12 in. At one end lay off two points, 1 in. on each side of the center line, and erect a perpendicular joining the two points, thus marking the 2-in. diameter. As the taper is $2\frac{1}{2}$ in. per foot, add $2\frac{1}{2}$ to the diameter of the small end, obtaining $4\frac{1}{2}$ in.; then, at the other end of the 12-in. line, lay off $2\frac{1}{4}$ in. on each side. Join these points with the points marking the smaller diameter. From the small end, measure $7\frac{1}{2}$ in. along the center line, and at this point draw a vertical line intersecting the two inclined lines. The length of this line, between the inclined lines, will be the required diameter of the large end of the piece.

Alarm Circuit for Open Fuses

On electric circuits that supply current to draft fans, electric heaters, water sterilizers, and the like, it is important that an attendant should have instant knowledge of trouble in the circuit. Frequently the attendant's station is at a distant part of the plant, and for this reason the circuit shown in the drawing was devised to give an audible alarm when a fuse blows out. Each fuse is bridged by a relay; this may be of almost any type or size, but should have a resistance of 100 ohms or more. The contacts of the two relays are bridged and connected to an ordinary

doorbell and dry battery. If desired, a switch may be cut in on the bell circuit to disconnect it when necessary.

The operation is as follows: Current flows from the main line through the fuses to the load; the relays do not operate, because they are short-circuited by the fuses. Should a fuse go open, the circuit would still be continuous through the relay winding, causing the relay to operate and the alarm to ring. The purpose of the fuse is not defeated, because the resistance of the relay winding will not allow an excessive flow of current.—C. M. Crouch, Minneapolis, Minn.





How to Make a Potato-Plant Sprayer

By GEORGE G. MCVICKER

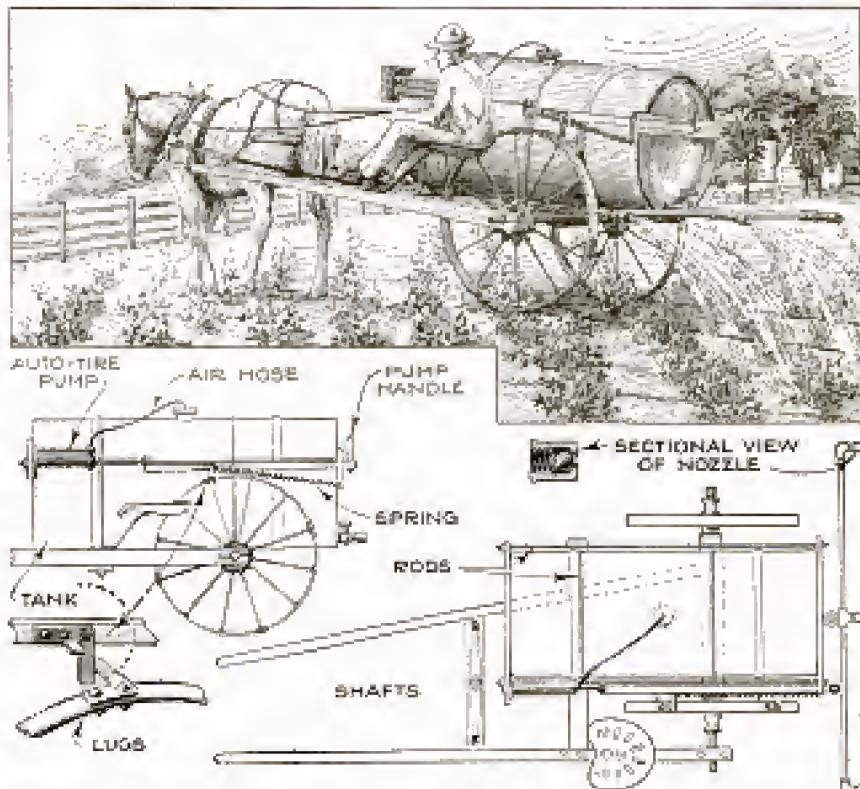
WHERE acres of potatoes are threatened with destruction by the potato beetle, it is entirely out of the question to combat the insects by the time-honored method of going along the rows and brushing them into a can, or cracking them between two stones, and spraying must be resorted to if the crop is to be saved. If the area planted with potatoes is small, a hand sprayer may be used, but for a large acreage the work is best done by a horse-drawn sprayer.

The homemade sprayer described in this article is made by mounting a suitable container, which may be a steel oil barrel, an old water tank, or something of a similar character, on wheels, and providing it with a pair of shafts, arranged so that the horse will walk between the rows, the wheels straddling the plants. The shafts are thus arranged by placing one shaft on the outside of one wheel and attaching that on the opposite side at an angle. The container is fastened to the frame by iron rods, bent to fit over the container, and threaded at the ends, which are passed through holes drilled in the frame cross members, then drawn up

tight by nuts. To maintain the necessary air pressure in the tank for forcing out the spraying solution, a three-cylinder automobile-tire pump is attached to a piece of plank across the front end of the tank; this is held in place by long bolts passing through a similar plank at the rear. The plunger rod, which is fastened to the piston rod of the pump, is made from $\frac{1}{2}$

by 1-in. flat iron, with one end bent at right angles and a hole drilled through it for the piston rod of the pump. In the opposite end of the rod a hole is drilled, and a handle attached so that the pump can be operated by hand, if desired. This plunger may be made of hardwood.

Four projecting lugs are riveted to the wheel on the pump side of the sprayer. These lugs are so arranged as to engage



Spraying Potatoes with a Homemade Sprayer, to Protect the Crop from the Ravages of its Insect Enemies: Air Pressure for Forcing the Spray through the Nozzles is Obtained by Means of a Tire Pump

with a short vertical arm riveted to the plunger rod and push it forward until the lug on the wheel slips off and allows a spring to return the plunger. If it is desired to prevent the pump from working when the device is on the road, the plunger-rod spring can be detached, or the lug on the plunger made as shown in the drawing. To connect the pump to

the tank, a hole is drilled in the cap, large enough for the stem of a tire valve to pass through, and this is held in place by lock-nuts and rubber washers.

The piping and nozzles are made from standard pipe and fittings, and the flow of spraying solution is regulated by a globe valve; separate valves may be added to regulate the flow of individual nozzles. The nozzles are made from ordinary pipe caps, in each of which two

$\frac{1}{16}$ -in. holes are drilled at an angle, as shown in the sectional view. In each cap a $\frac{3}{16}$ -in. brass ball, or a marble of the same size, is placed to make the solution form a spray. A seat for the driver can be mounted on the outboard shaft if this is desired. As the sprayer is jogged about the field, no agitator will be needed, in most cases, to prevent the heavy arsenical poisons commonly used from settling to the bottom.

Brush Removes Refuse from Gutters

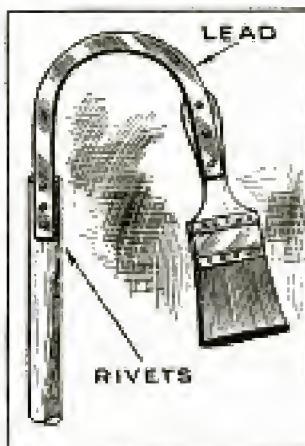
When the eaves troughs become filled with leaves, and other litter and refuse, it is quite a task to clean them out. The work is usually

done by climbing a ladder and cleaning out the gutter for a few feet, then moving the ladder again and again until the work is complete. A simpler and safer method, since no ladder is required, consists in using the device illustrated. An ordinary brush is attached to one end of a bar of heavy lead or solder, and the opposite end of the bar is fastened to a light pole of the proper length. When this is done, the lead or solder bar is bent so as to allow the brush to sweep the gutter, with the operator standing on the ground.

Iron or steel can, of course, be used instead of the lead, if available.

Preventing Discoloration of Prints

Professional photographers rarely, if ever, have trouble with brown spots appearing on the prints in the fixing bath, because the prints are carried into the hypo solution free from developer. This is done by the use of an acetic-acid "check" or "stop" solution, in which the prints are immersed when they are removed from the developer, and before placing them into the hypo. This solution is made by adding commercial acetic acid to clean water, the proportions being immaterial except that enough acid should be used to neutralize completely the developer that remains on the print. The action of this acetic-acid bath is due to one of the most familiar chemical laws, namely, that an acid neutralizes an



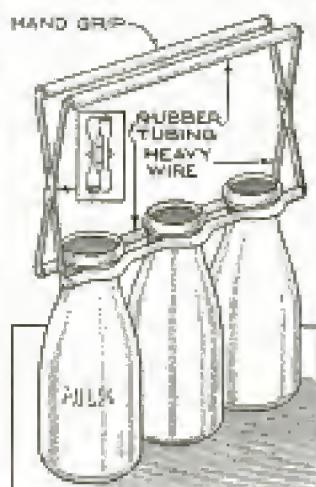
alkali and vice versa. The developer is invariably an alkaline solution, while the stop is an acid, and consequently, if the latter is sufficiently strong, the alkaline developer will be neutralized and entirely removed from the print.

It is the introduction of prints into the hypo bath with developer on them that causes the dirty brown spots so frequently seen. Not only this, but unless the prints are completely immersed in the hypo, the exposed portion of the print will continue to develop. Remember that developer has no place in the fixing solution, and it is the oxidized developer in the latter that causes it to turn brown. By using the acetic-acid solution, and mixing up a fresh one from time to time, if a large number of prints are being developed, clean prints will be obtained, and the fixing bath can be used until completely exhausted. The acetic-acid solution is entirely harmless to the prints, and as it is cheap, a clean stop should be used for each batch of prints.

Handy Milk-Bottle Carrier

Milk deliverymen and others who have occasion to carry several bottles at a time will find the carrier shown in the drawing a great convenience and timesaver.

Two pieces of heavy-gauge wire or light iron rod are bent as shown, the horizontal parts being covered with rubber tubing. The joints where the ends of the rods meet are soldered, and the carrier is held together by a rivet at each end. By placing the bottles on the ground and releasing the grip on the handles the bottles are instantly freed.

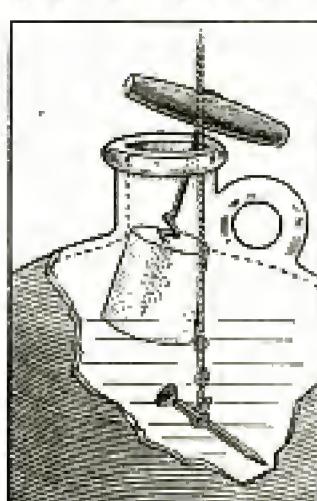


Testing Real and Artificial Silk

Real silk, when burned, smells like burning feathers, while artificial or "fiber" silk has the smell of burning wood. Another way of testing is to place a few threads from the sample into a test tube. The tube is heated and a piece of damp litmus paper held over the open end. If the sample is real silk, the paper will turn blue, but red if it is artificial.

Extracting Cork from Bottle

Corks that have been pushed past the neck inside a bottle or jug can be removed with comparative ease by a simple method. The vessel is filled with rather hot water, which softens the cork a little, and makes it easier to pull out. Then a large-headed nail, tied on the end of a string, is dropped into the bottle and the cork is maneuvered so that the small end partly enters the neck. The string is then pulled up so that the head of the nail bears against the bottom of the cork and the other end against the side of the vessel.



It is now a simple matter to run a corkscrew into the cork, which is then easily extracted.—Arthur Nelson, Chicago, Ill.

Planting Dwarf Varieties of Beans

Dwarf or bush beans are generally the earliest and hardiest. In garden culture they are planted in rows about 18 in. apart, 2 in. deep, and 3 in. apart in the row; in field culture, in drills 2 to 3 ft. apart, so that a horse-drawn cultivator can be used. Until the blossoming period, frequent but shallow cultivation should be given. Seed of the larger varieties should be planted with the eye downward. Two pounds of seed will be sufficient for 100 hills of limas, and 250 to 300 hills of other varieties, and for about 100 ft. of drill; 1 bu. should be planted per acre. Beans should never be worked when they are wet from dew or rain, as this causes rust. Beans can be planted so as to obtain a succession in the crop until within about 60 days of frost.

Nonoverflowing Lamp Filler

A length of brass tubing was fitted to the rear of the oilcan and the joint carefully soldered. The opposite end of the tube was then

brought around and securely soldered to the spout in the manner shown, after flattening considerably the circular opening in the tube end. A leather washer was also placed underneath the screw cap to make it air-tight.

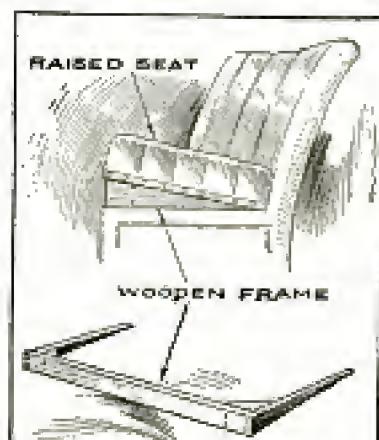


In using this can, the end of the spout is inserted into the filling hole of the oil reservoir of the lamp or stove for a short distance. As the oil runs out, air enters at the end of the tube, but as soon as the level of the oil rises to the end of the spout, the air supply is cut off and the flow of oil ceases, thus preventing the liquid from overflowing.—Dexter W. Allis, Whitman, Mass.

Making Auto Seat More Comfortable

An automobile seat that is nearly flat is not the most comfortable for long hours of steady driving, as the driver slides forward each time the car is stopped or its speed reduced.

An upward tilt given to the front edge of the cushion overcomes this to a great extent, and makes riding somewhat less tiring. To tilt the seat, a simple three-sided wooden frame is made and fitted underneath the cushion, as illustrated. The frame can be permanently attached with screws, if it does not interfere with the accessibility of tools or other accessories carried under the cushion.



The farm bell will be heard farther if placed on top of the windmill tower.

Condenser for Auto Radiators

The efficiency of alcohol in the radiator of an automobile to prevent the cooling water from freezing, depends entirely upon the quantity of alcohol present in the solution. Alcohol is quite volatile, and when the water becomes heated the alcohol quickly evaporates.

However, if some form of condenser is used, the alcohol, and also more or less of the steam from the water, will be condensed so that the loss will be prevented and the solution retain its cooling and antifreezing properties for a longer time.

The drawing shows such a condenser, made from a 3-in. pipe tee and some copper tubing. Two pasteboard templates, cut to fit into the ends of the tee, were made to hold the ends of the copper tubes in place. Then, melted babbitt was poured into the side opening in the tee, fastening the tubes securely in first one end and then the other. The device is made to fit the radiator-filler pipe, and should be placed pointing toward the front of the car, so that the cold air will pass through the condenser tubes when the car is in motion.—Frank N. Coakley, Buffalo, N. Y.

Standard and Summer Time Shown on the Same Dial

It has been the experience of residents in some communities that neighboring towns have set their time ahead an hour

during the summer months, while their own town did not. Naturally, the confusion under such a system is considerable, as those living in the separate communities must ever bear in mind two different time standards. A commuter found that by setting his watch to

agree with the standard time in effect in his suburban town, he was continually being embarrassed by the conflicting daylight-saving time by which he did business in the city. In order to make his watch



FIGURES IN RED

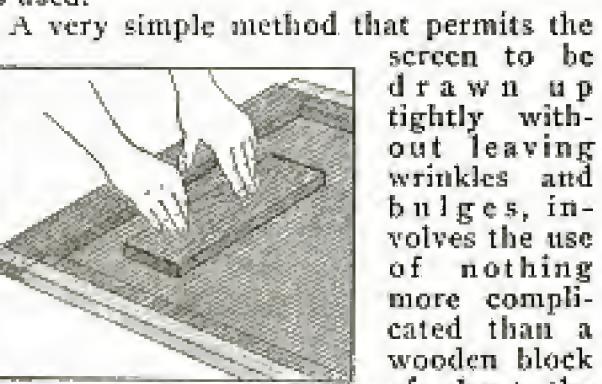
indicate both times, he had an extra set of red numerals lettered on the dial of his watch, for the daylight-saving time. These may be printed on small stickers, and stuck to the crystal of the watch, if it is not desirable to letter them directly on the dial.—M. J. Rystrom, Rockford, Ill.

Tissue Paper as a Moth Preventive

A friend of mine keeps a uniform in a small closet, and, happening to be there at a time when the uniform was removed, I noted the absence of the usual mothballs. Upon asking him about this, I was shown a small quantity of tissue paper scattered around the closet, and also how the moths had eaten a considerable portion of the paper, but had not attacked the clothing. My friend said that he had never known clothes that had been wrapped in tissue paper to be harmed by the insects, as it appeared they preferred the paper to the cloth.—Carl H. Kauffmann, Santa Ana, Calif.

Applying Screen Wire

Drawing up screen wire tightly and evenly on the frame, is usually a rather difficult job, even when considerable care is used.



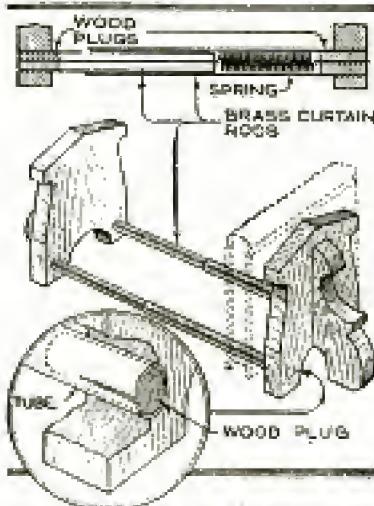
A very simple method that permits the screen to be drawn up tightly without leaving wrinkles and bulges, involves the use of nothing more complicated than a wooden block of about the same thickness as the screen frame. One end of the screen is tacked to the frame, and the block is placed inside at the opposite end. The screen is laid down over the block, and, placing the thumbs of both hands on the side of the frame or at the edge, and with the rest of the fingers bearing down on the block, the latter is drawn back, pulling the wire with it. When the proper tension has been obtained, it is held with one hand while a tack is driven with the other; this operation is repeated as necessary until the wire has been applied. The screen should be laid on a table or other flat surface in order to provide a support for the block.

Cleaning Tarnished Silver

Tarnished silver may be cleaned by the so-called electrolytic method as follows: Place in a clean earthenware vessel, or an enamel one in which the enamel is unbroken, a solution of 1 teaspoonful of soda ash, or baking soda, and 1 teaspoonful of common salt, dissolved in 1 qt. of water. A sheet of aluminum or clean zinc is immersed in the solution, and the pieces to be cleaned are placed in contact with this; both the zinc or aluminum plate and the silverware to be cleaned should be completely covered by the solution. Heat nearly to boiling. When the tarnish disappears from the silver, rinse in cold water, and wipe with a soft cloth.

Self-Adjusting Book Ends

A convenient rack for holding the most commonly used books on the desk or library table can be made from two pieces of hardwood which are cut to form supports or ends; these can be either plain or as ornamental as the taste and wood-working talent of the maker decide. Holes



are drilled in each, into which the ends of ordinary telescoping curtain rods are inserted. If there is any difficulty in getting the rods to fit tightly, the ends can be split with a hacksaw and wooden plugs driven in to expand the tubing. A short length of spring, having its ends secured to the opposite blocks inside of each rod, makes the fixture self-adjusting.

Rejuvenating Grass Rugs

Grass rugs are largely used on porches, and for rooms in summer homes, and give an atmosphere of coolness. Whenever such a rug becomes frayed and worn, it can be brightened up, and its life considerably prolonged, by cleaning it thoroughly and applying one or more coats of paint of any desired shade.—H. A. Norrell, Augusta, Ga.

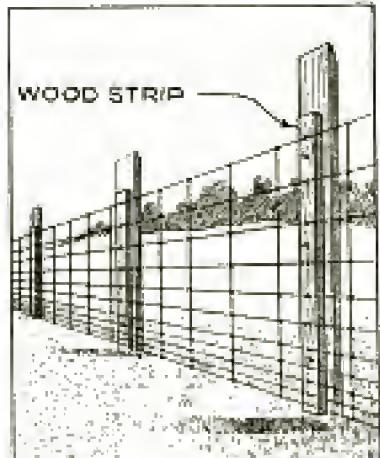
Novel Apron for Kitchen or Shop

It is only necessary to add a few eyelets along the bottom edge of an ordinary apron to increase its convenience very materially for certain classes of work. In use, the eyelets are placed over a corresponding number of small hooks, screwed into the underside of a table or bench, while the apron is tied around

the waist in the usual fashion. The movements of the wearer are not in the least interfered with and she can sit or stand as desired. An apron of this kind will sometimes be found of service in factories and shops; in this case the apron may be fastened to the table or bench semipermanently, so that when the workers leave, it will be necessary only to untie the apron strings.

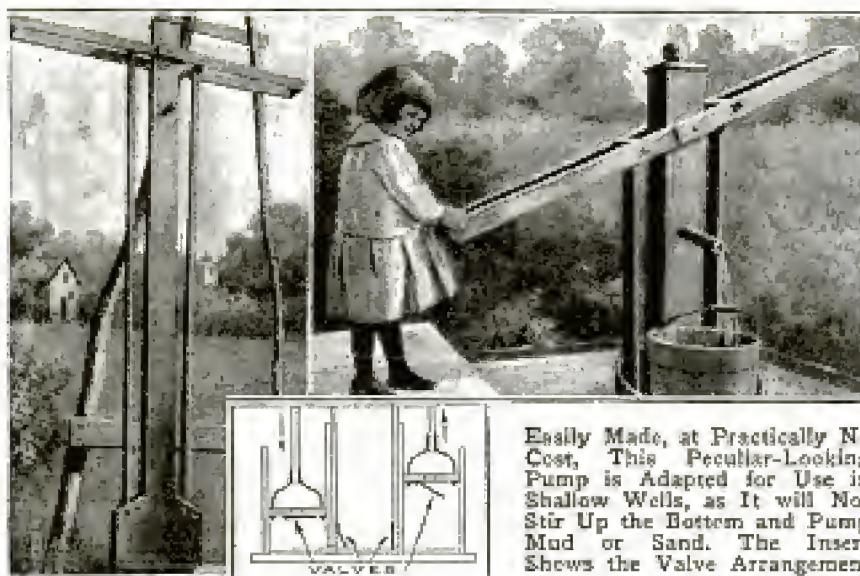
Facilitating Removal of Fence Posts

In most soils, wooden fence posts last but a few years, and in some localities, under particularly unfavorable conditions, their life is exceedingly short. Where woven-wire fence is used and attached to the posts with staples, a great deal of labor is necessary to pull the staples when a new post must be set to take the place of one which has rotted off at the surface. If a piece of wood, about 1 by 3 in., is placed between the fencing and the post, and the staples driven into the strip, which is in turn fastened to the post with about three nails, the whole strip can be removed from the post easily, without in any way disturbing the staples, and without the hazard of breaking one or more strands of wire in attempting to remove them.



Homemade Pump for Shallow Wells

For pumping water from shallow wells, a simple wooden pump may be made, that costs practically nothing, and that is well worth the time spent in its construction. A square box is made, closed at each



Easily Made, at Practically No Cost, This Peculiar-Looking Pump is Adapted for Use in Shallow Wells, as It will Not Stir Up the Bottom and Pump Mud or Sand. The Insert Shows the Valve Arrangement

end, long enough to reach the bottom of the well, and to project 3 or 4 ft. above the ground. On two opposite sides of this box, at the bottom, holes about 2 in. in diameter are bored, and over these flaps of flexible leather are fitted; these flaps are nailed above the holes, so that they hang downward over the latter. On

these sides of the box are built the two "cylinders," which are simply square open-top boxes, in height a little more than the stroke of the pump, but less than the depth of the water in the well; in these wooden blocks are fitted closely.

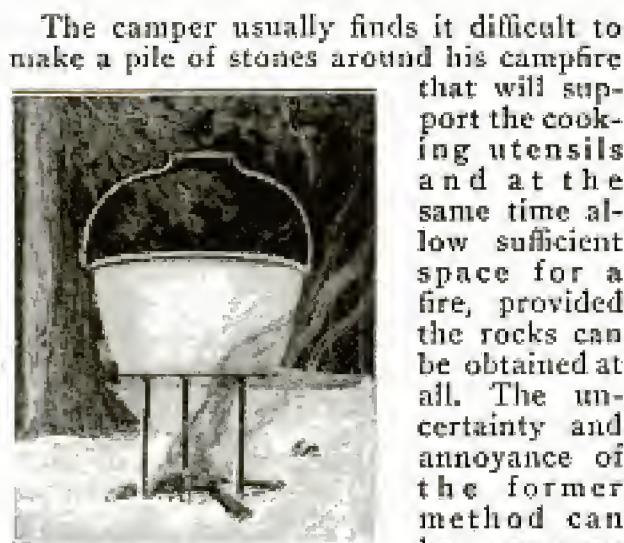
A hole is bored in the center of each block, and a leather flap valve, similar to the ones previously made, fitted to the underside. A hole is also bored in the side of each cylinder opposite the one in the long box. The arrangement of the valves is clearly shown in the insert.

Iron yokes are made and fitted to the blocks, to carry the pump rods, which are also of wood. These rods are pivoted to the pump handle.

One peculiar advantage of a pump of this character is that, owing to the fact that there is no

suction, the pump does not stir up mud or sand, in spite of the fact that it is set on the bottom of the well. This is so because the water flows over the tops of the cylinders. The water runs from the pump from a 2-in. spout which is placed at right angles to the handle.—Chester C. Cook, Chicago, Ill.

Nails as Campfire Irons

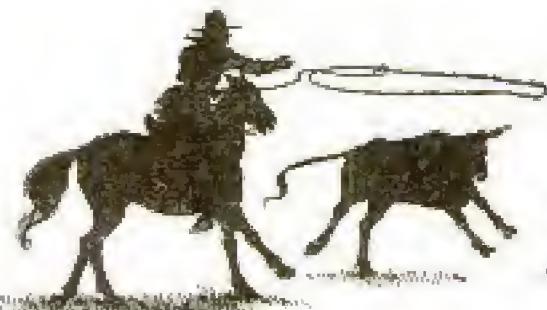


The camper usually finds it difficult to make a pile of stones around his campfire that will support the cooking utensils and at the same time allow sufficient space for a fire, provided the rocks can be obtained at all. The uncertainty and annoyance of the former method can be overcome by carrying a few 80-penny spikes in the kit. These are merely pushed into the ground and support the cooking utensils without interfering with the fire. Spikes of the size mentioned are about 8 in. long.

—Lloyd L. Stewart, Ames, Ia.

Soldering-Flux Containers

For the experimenter using small amounts of flux, there is no better container than one made from an old toothpaste tube. Open the crimped end of the tube with a pocketknife, and, using the blunt end of a pencil, restore the tube as nearly as possible to its original cylindrical shape. Clean out the interior with a toothbrush. Cut a section out of a clean lampwick, and place it in the nozzle of the tube to be used as a spreader and feeder of the flux. Fill the interior of the tube loosely with absorbent cotton; then make up a saturated solution of zinc chloride, by dissolving the chemical in water until no more will dissolve, fill the tube, recrimp the end, and the container is ready for use. A container of this type will operate even more successfully with a paste flux, in which case the cotton filling and the wick in the nozzle will not be needed and are, therefore, omitted. —Werner W. Baumeister, Cambridge, Massachusetts.



THROWING THE LARIAT

By JOHN F. THORNTON Jr.

WHAT boy, after visiting a "Wild West" show, has not made a noose in a piece of old clothesline and set out to emulate the cowboy? Unless he has had instruction from some one proficient in the use of the lariat, however, it is probable that he has given up the attempt as useless. This is to be regretted, for besides being a typically American sport, lariat throwing is an educator of the eye, and an excellent developer of the muscles of the fingers, wrist, arm, shoulder, back, and legs. There is a good deal of fun in it, also, and it may be a very useful accomplishment. Many a hapless skater or canoeist has been saved by the prompt

called the hondoo (pronounced "ondoo"). Make it a little heavier by winding another piece of wire round its curved end, as shown. The chances are that one will have to try various amounts of wire, after he has begun to practice, until a hondoo has been obtained that will give the best results. Another form of hondoo is a small iron ring, or thimble, such as is used on sails. One end of the "lass rope" is unraveled, and the loose ends brought neatly round the ring from opposite directions, meeting again at the unwound part of the rope. Here they are bound tightly in place along each side of the rope with a piece of fine wire. The lariat is com-



The First Steps in Throwing the Lariat, Showing the Preliminary Swing and the Actual Cast: A Post, or Some Similar Object, is Used as a Target until Proficiency is Attained. When Some Moving Object may be Pressed into Service

action of a spectator who was able to throw a rope with some degree of accuracy and skill.

The very best lariats are made of plaited rawhide. For practice, however, a rope of braided cotton or linen, $\frac{3}{8}$ in. in diameter, will serve. The standard lengths for straight roping—catching objects—are 40 and 50 ft. For fancy swinging, a rope 16 ft. long will do.

Double the rope at a point 5 in. from the end. Bind it by winding both thicknesses for 1 in. with strong, light wire, as shown at the top of the full-page illustration. The loop, or eye, thus formed is

pleted by drawing the other end of the rope through the hondoo, so as to form a running loop, and by knotting the unlooped end, to prevent it from unraveling.

Many lariat experts start with a loop about 1 ft. in diameter, and allow the rope to slip and the noose to grow larger as it is swung. It is best, however, to start practicing the throw with a large loop. Draw the rope through the hondoo until there is a noose 4 or 5 ft. long. Bend the rope back at the hondoo until it lies along one side of the loop. Then grasp both thicknesses with the right hand, at a point about 15 in. from the hondoo.

The little finger should be between the two thicknesses, and the third and fourth fingers round both. The forefinger should cross under one thickness and extend along the underside of the loop rope, as shown in the illustration.

Take position in front of a post. Coil the slack rope in the left hand, so that it will slip off easily, coil by coil; be sure that there are no kinks in the line. Lift the noose over the head, and begin to swing it from right to left. Do not hold the wrist stiffly; imagine that it is an axle and that the loop is a wheel revolving in a horizontal plane over the head. When this movement has been practiced several times, it will be found that a quick, jerky turn of the wrist causes the loop to spread wide open.

It is well to practice this preliminary swing until it can be performed smoothly, before one attempts to make a cast. The proper time to throw the rope is at the moment when the swinging hand comes round from back to front. Step quickly forward, and bring the hand, palm down, forward and to the level of the shoulder. Let the arm stretch to its full length without interrupting the swinging motion, and let the loop go at the post.

The first cast will probably fall far short. But if these instructions have been followed, the noose will sail straight toward the mark without losing its circular form—and that is encouraging. If care is taken to regulate the size of the loop, the length and force of the swing, and the angle of the throw—and if patience and thoroughness in practicing casts are exercised—it will not be long before one becomes fairly expert in this, the first and most important use of the lariat.

The easiest of the cowboy's roping stunts is that of catching a man or animal as he passes at full speed. In roping an animal, the forefoot is always the target, never the head. The open loop is thrown just in front of the moving feet so that the side of the noose nearest the animal is on the ground and the other side is in the air. If the animal keeps moving a second longer, it will step into the noose and become securely caught. In roping animals use a small loop, as they will jump out of a large one. Wait until the steer, cow, or horse has passed, then it will not see the rope coming, and will be unable to dodge. If one is on foot and ropes an animal's head, see to it that the rope is at right angles to the animal; if one is behind it, one will be pulled along by it. One should brace oneself, with the rope held tightly across both

thighs. It is a good idea to wear gloves to avoid any risk of burning the hands.

The "crinoline" is one of the most popular of the fancy lariat tricks. In this stunt the rope appears as a ring, about 5 ft. in diameter, revolving around the body as a center, about waist-high. Prepare for this trick as follows:

Holding the rope as for straight casting, extend the right hand, palm upward, straight out to the side until the arm forms an angle of about 30° with the body. Now, moving the hand rather slowly, describe a horizontal circle in front of the body. When the hand is at the farthest point in front of the body, and the circle is half completed, turn the wrist so that the palm is downward. At the same time drop the loop, but retain a firm grasp on that part of the rope which is held with the little finger, now using all the fingers to hold that part, as shown by the dotted lines in one of the illustrations. Do this without stopping the circular motion of the hand. Continuing to move the hand more or less rapidly in circles, widen the loop into a circle that spins round with a motion that corresponds to that of the hand. If the slack rope is twisted between the thumb and fingers of the left hand in the direction in which the circle is revolving, it can be kept from becoming tangled. One will not, of course, be able to spin the crinoline after ten minutes' practice, but persistent effort will very soon make one proficient.

In spinning the crinoline round the body a loop at least 7 ft. long will be needed. With the right hand grasp the loop as before, but this time about 3 ft. from the hondoo instead of 15 in. With the left hand hold the same side of the loop about 1½ ft. to the left of the part which is held in the right hand. Now, with these few exceptions, take the same position as before, with the left hand just in front of the right trouser's pocket. Such a position will leave part of the loop lying open on the ground to one side.

With a long, swinging, circular motion, bring the right hand up over the head. Use the left hand only to keep the loop open until the right hand has been raised. Then, without stopping the circular motion, drop the loop round the body. Continue to twist the right wrist and there will be a twirling crinoline spinning round the body. Its size can be regulated by the speed with which it is twirled.

A backhand throw is useful when the object is behind one. Hold the rope much as shown in the lower figures. Step back-



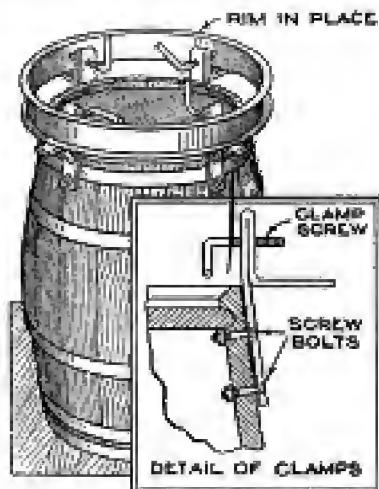
The Upper Figures Show the Method of Making the Hondo and of Holding the Lariat; the Center Ones, the Position for Spinning the "Crinoline" in Front of the Body, the Method of Holding the Noose Before Dropping It over the Body, and the Crinoline Spinning around the Body. The Lower Figures Show the First and Second Positions in Making a Backhand Throw.

ward with the right foot, turn facing the object and swing the loop backward and up. A cowpuncher takes care that his horse's head or tail is toward a roped animal. Otherwise he would be dismounted or his saddle would turn. He never ties his lariat to his saddle horn. It is a dangerous practice, for a steer or

even a smaller animal, improperly roped, can throw a horse and man. The real cowboy holds the end of his lariat loosely in his left hand until his animal is caught. Then he takes a couple of quick hitches round his saddle horn that will hold if necessary, or that he can cast loose if occasion demands.

Holder for Demountable Rims

A tight-coopered wooden barrel, such as an old oil barrel, arranged as shown in the drawing, affords a very serviceable



and substantial workbench for holding demountable rims while applying or removing a tire. Furthermore, the clamp screws serve as a means for expanding a split rim after the tire is in place, and the height of the

barrel enables a convenient working position, as no stooping is required. Four combination brackets and screw clamps, of the type shown, are bolted to the outside of the barrel, the clamp screws being of sufficient length to make the device adjustable to rims of any standard size, and, also, to expand split rims. The brackets are forged from wrought iron. The lower extension on the brackets forms a rest for the rim so that it cannot slip off. When used outdoors, the barrel may be painted and lettered with the firm name, serving as a conspicuous advertisement. By filling the barrel with stones or concrete, it is almost impossible to move the device when working on it.

Fuller's Earth for Clutch and Brake

Fuller's earth can be applied to the clutch and brake linings of an automobile easily and thoroughly by using an ordinary insect-powder gun or bellows. The powder gun can be bought for a few cents and holds enough of the chemical for two or three heavy applications. Fuller's earth, and also talc, are used in the manner described to remedy the slipping of oil-soaked brake and clutch linings.

Razor Strop for Campers

An article that the camper generally leaves hanging on a tree or loses somewhere along the route is his razor strop. A veteran camper has developed an idea that makes it practically impossible to forget or lose the razor strop, by simply fastening it to the inside of his belt. A strip of a used strop, about a foot long, is cut and the ends are riveted to the inner side of the belt. The strop is thus always at hand; it is well protected, and by hooking the belt buckle over a nail or branch is ready for use immediately. There is really nothing lost by narrowing the strop to belt width, and it may be made of any length desired, so long as it does not interfere with the passage of the buckle when the belt is worn.—Robert Page Lincoln, Minneapolis, Minn.

Improvement for Rolling Ladders

The rolling ladders that form a familiar part of the equipment in most stores and factory stockrooms, sometimes have a disagreeable and disconcerting habit of rolling, especially if the person on the ladder happens to lean a little too far to one side. In order to overcome this objection, use has been made of the attachment illustrated, in which the wheels are mounted on the ends of curved arms,



hinged in a bracket made to fit one of the rounds of the ladder. Ordinarily, when there is no weight on the ladder the spring pulls the wheels toward the center and raises the ladder from the floor, but as soon as anyone steps on the ladder, the tension of the spring is overcome, and the wheels are forced out until the end of the ladder is resting on the floor.—Edwin Schubach, Chicago, Ill.

Protecting Trees from Insects

In summer, when it is desired that no ants, caterpillars, or other crawling insects, should climb the trees, some kind of a barrier is necessary.

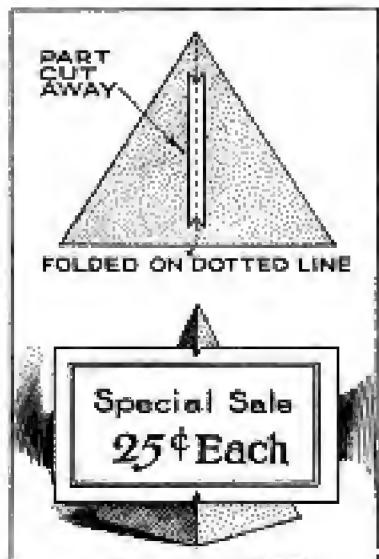
The simplest, and one of the cheapest, methods is to place a wide band of cotton batting around the tree at some convenient height, fastening it to the tree with wire. The edges of the batting, protruding from underneath the wire, when fluffed, present an impassable barrier to any type of crawling insect or small animal, the cotton not affording a foothold for the latter.

Simple Price-Tag Holders

For holding display cards, and the like, securely, and in such a manner that they are difficult to upset, a simple holder can be made of stiff paper or cardboard.

The stock from which the holder is to be formed is cut into the shape of a triangle which is then folded along its center. A slot is cut out along the center, as shown, and the triangular projections at each end of the slot serve to hold the card in place.—

Frank N. Veloz, New York City.



**Special Sale
25¢ Each**

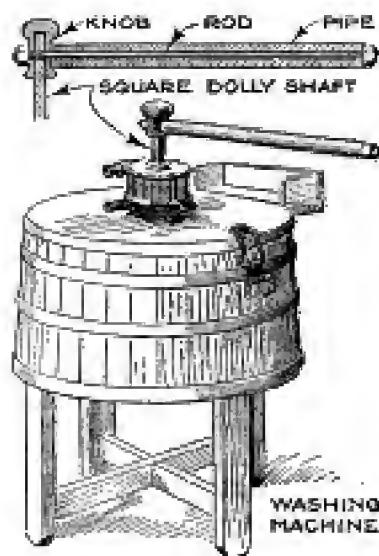
Glossy Photographic Prints

To make photographic prints with the highest possible gloss, the first requirement is that the grade of paper known as "glossy" be used. After they have been printed, developed, fixed, and washed in the usual manner, they are squeegeed face down, on a sheet of plate glass, that has been previously polished with a little French chalk on a cloth. The advantage of glass over the metal ferrotype plates ordinarily used is that one can look through the former to make sure that the entire print is in contact, without air bells between print and glass. However, the enameled ferrotype plates are much lighter and will not break.

Emergency Washing-Machine Handle

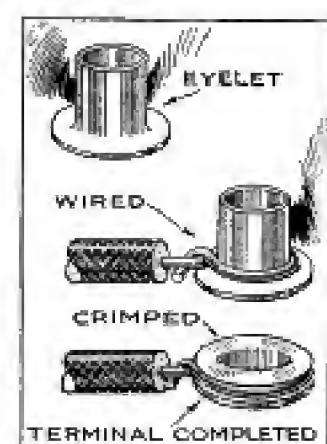
Many a housewife using a water-power washing machine is handicapped on wash day by low water pressure or a defective or worn-out motor. Also, it may happen that the water supply has been cut off for repairs to the mains, and there are other emergencies in which the operating handle shown in the drawing will be found of great convenience.

On machines of the type using a rotating-vane motor, the attachment of a suitable handle is a simple matter. The knob on top of the dolly shaft is usually held in place by a $\frac{1}{4}$ -in. screw through both shaft and knob; this screw is removed, and a long $\frac{1}{4}$ -in. stud run through the holes. A short section of $\frac{3}{8}$ -in. pipe is then slipped over the stud and clamped tightly in place with nuts and washers.



Wire Terminals Made from Eyelets

Practical terminals for electric wires that are held on bolt-and-nut binding posts, or for spark plugs, can be made by



using the eyelets commonly obtainable at stationery stores for binding papers, and the hand punch used with them. To make such a terminal, the bare end of the wire is looped once around the eyelet, which is then crimped in the hand punch, pressing the metal down tightly against the wire and making a terminal that will fit neatly over the screw and give a good contact. If solder is used after crimping, a practically solid metal terminal is obtained that will give a minimum of trouble.

Concrete Wall Adds to Warmth of House

In seeking to modernize a dwelling by giving it the appearance of having a high foundation, the owner tried the experi-



Building a Low Cement Wall around a House to Improve Its Appearance: The Owner has Found That the Floors of the Dwelling Are Now Much Warmer in Winter Than Formerly

ment of applying a 2-in. thickness of solid cement directly over the original foundation and siding. In this way the cost of the improvement was kept at a lower figure than would have been the case had the house been raised and the foundation made higher.

The main precaution taken was to see that there was a firm bond between the foundation and the wooden siding. At first glance it might seem that water would drip down between the concrete and siding, thus starting rot and giving frost a chance to open up cracks. Nails were driven into the siding at the corners of 6-in. squares, with their heads protruding, up to the height of the projected auxiliary wall. The concrete foundation was thoroughly cleaned and given a thin wash of pure cement. Then the forms were made and the concrete poured. A mixture of one part cement to two parts sand was used. The top of the wall fitted underneath the edge of one of the siding boards and was finished by increasing the thickness to 3 in., and sloping it slightly away from the house to run off the water; the corners were reinforced with wire mesh. After the concrete had set for about 24 hours, the forms were removed, and the surface marked off in imitation of brickwork, the lines being cut by running the point of a spike along a straightedge.

Keeping Linoleum Fresh

A mixture of equal parts of oil and turpentine, applied once a week, will keep linoleum looking fresh and clean. Palm oil, used alone, is also good, although not so good as the above mixture.

Poppies as Cut Flowers

Those who have undertaken to use Shirley or silk poppies as cut flowers are familiar with the shower of petals that follows cutting of the blossoms. Florists have a trick of preparing the poppies so that they can be used for cut-flower purposes. The bud of the poppy droops until it is ready to burst the green calyx that covers the flower, when it becomes erect. The flowers should be picked just before they shed this calyx, which is in two parts and splits at the bottom. The right moment for picking is when the calyx has split at the bottom just enough to show the color of the petals within. Cut the poppy at this stage, and gently pick off the green covering, place the crumpled-up bud in water, and the petals will open and will not fall off as they ordinarily do.

Hauling Boats from One Lake to Another

Faced with the alternative of digging a canal, buying two sets of equipment for



Hauling a Boat from One Lake to Another by a Miniature Marine Railway Is the Way a Body of Sportsmen Took to Avoid Digging a Canal to Connect Twin Lakes

use in twin lakes, or continue to carry their outfits from one to the other, a body of sportsmen solved the problem by means of a one-man marine railway.

An incline leads to each lake and a homemade capstan, or windlass, was located at the highest point, so that boats could be pulled up from either side. A single car or cradle, fitted with flanged wheels, runs on tracks laid on the inclines. In operation, the track is rolled into the water, the boat floated into the cradle, and pulled up by means of the windlass. Too rapid progress down the incline on the other side is prevented by means of a rope and snubbing block.—L. J. Ellison, Dubuque, Ia.

Using a Motorcycle for Power

An Illinois farmer uses his motorcycle for running light machinery about his farm, and while not as convenient as a gasoline engine, it can be used where there is not enough work for a heavy engine, as in this case. Of course, the motorcycle engine cannot be run as steadily as a water-cooled engine, but is good for jobs where it can be stopped occasionally and allowed to cool.

The motorcycle is run up onto a wooden framework or platform, and when in use is supported by its stand, at the rear, and by a wooden crosspiece under the frame directly behind the front wheel; this latter is removable and is not inserted until the motorcycle is in place. A pulley shaft, which has a sprocket wheel attached to

it, is mounted on the frame, and after the motorcycle is in place, the chain is removed, shortened slightly, and reconnected around the sprocket on the shaft.



As There Is Not Enough Work to Require a Gasoline Engine, an Illinois Farmer Uses His Motorcycle to Furnish the Necessary Power for Grinding Feed, Cutting Up Firewood, and Other Light Jobs

A good-sized fan, driven by a belt from the shaft, and mounted so as to direct its breeze on the engine, is the simple means employed to prevent the engine from becoming overheated.—Charles Albert, Chicago, Ill.

Bridging Fuses

The fuse is the safety valve of the electrical system, put there for the protection of life and property. If a penny or a piece of wire is inserted when the fuse blows, that protection is removed, and the wires may grow red-hot, and even melt, thereby starting a fire in some concealed place, where it might not be discovered until too late to save the building. If a fuse blows, especially if it blows repeatedly, notify the lighting company, or a reputable electrician, and have any defects corrected. Fuses of standard make only should be used, if the utmost protection is to be given to the system.

Clearing Stained Negatives

About as good a clearing bath as one can use for stained negatives—those that come out of the pyro-developing solution with too much yellow color—is made by dissolving 60 gr. or 1 dr. of powdered alum in 20 oz. of water, and adding 1 dr. of sulphuric acid. Immerse the negatives in this solution for a few minutes, remove, wash, and dry.

Reddish-looking spots with an irregular outline are caused by specks of iron in the water, and they will usually succumb to the sulphuric acid and water solution alone; this may be safely used twice as strong as indicated above.

Subduing the Ice-Cream Freezer

Two simple means of preventing the ice-cream freezer from moving with each revolution of the crank, by holding it to some solid support, are shown in the photograph and drawing. A piece of 1 by 8-in. board is nailed to the bottom of the bucket so that the ends project about 2 in. on either side. The freezer can then be

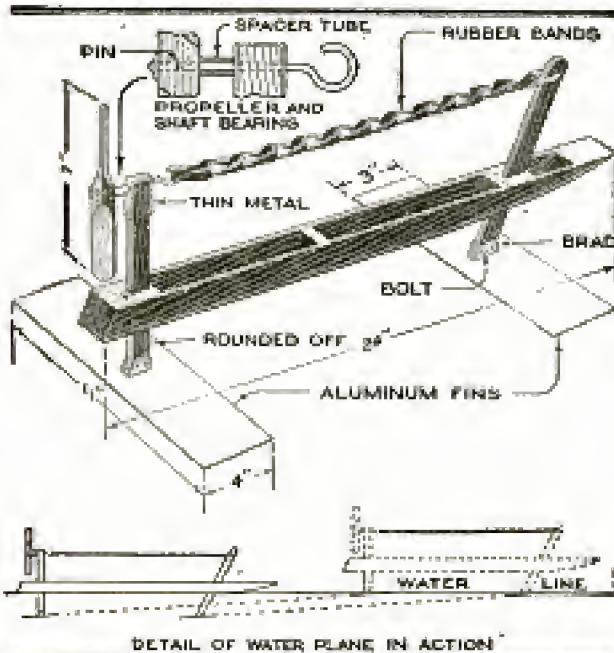


Two Methods of Holding the Ice-Cream Freezer Stationary: At the Left, a Board on the Bottom of the Freezer Allows It to be Clamped to a Solid Support; Right, the Wooden Frame Inside a Laundry Tub

fastened with an ordinary clamp. The drawing at the right shows a frame set into a stationary laundry tub to bring the machine to a convenient height for operating. A movable frame was built to fit into the tub, and a piece of wood across the bottom of the freezer, as in the first example, rests between two cross strips on the frame and prevents the machine from moving.

A Toy Water Plane

The toy water plane shown in the drawing is something of a novelty in the way of model water craft, as the hull only



DETAIL OF WATER PLANE IN ACTION

A Toy Water Plane That Rides on the Surface of the Water When Its Propeller is Revolving

rests upon the water when the propeller is not revolving. In traveling at full speed, the hull leaves the water quickly and rides with the fins on the surface of the water, as illustrated.

The sides and bottom of the hull are built up from strips of pine, about $\frac{1}{8}$ in. thick, blocks being used to space the sides the proper distance apart and for the attachment of the wooden supports for the propelling mechanism and fins. The sheet-aluminum planes, or fins, are mounted as shown, so that each is tilted at the same angle. The plane is driven by a model-airplane propeller, which, for a 24-in. water plane, should be about 7 in. long, and the power is derived from a motor made of a number of rubber bands linked together.—Donald W. Clark, Buffalo, N. Y.

Another Use for the Electric Fan

Electric fans of the oscillating type can be made to do double duty, as an advertising feature of a window display. This is done by attaching a circle of wallboard or light wood around the outside of the wire fan guard. Suitable advertising matter is painted on this, or small light articles, such as combs, pocketknives, and the like, can be attached without interfering with the ordinary operation of the fan.

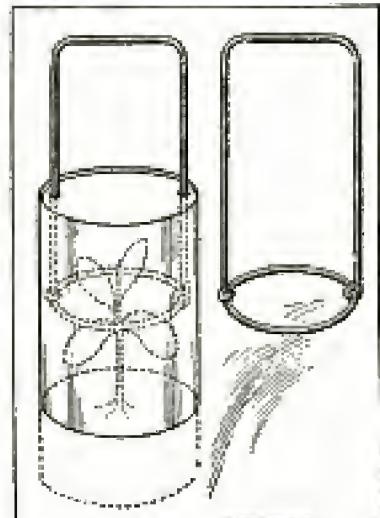
Using Auto Battery as B-Battery

Knowing the inefficiency and weakness of the ordinary radio B-battery, and that the performance of the radio set depends largely upon this battery, an operator devised a method for tapping the 12-volt storage batteries of a truck and car that are housed in a near-by garage. Two sets of wires are run from the radio set to the garage, each set terminating, at the garage end, in a plug that will fit in the dash-lamp socket on the car and truck. The house ends of the wires are connected to the set in place of the B-battery. When the two motors are brought in in the evening, the dash bulbs are removed and the wires plugged in. This arrangement gives a 24-volt B-battery of great power. A rheostat is used to step down the voltage to that found to be the most efficient for the particular type of vacuum tube used. The amount of current drawn from the storage batteries is, of course, restored the next day, when the motors are running.—Philip A. Wall, Bedford, Massachusetts.

A Tool for Transplanting

When transplanting small plants, a simple device made from a tin can and a bit of stiff wire will save considerable work.

One of the ends of a can is melted or cut off square, so as to provide a cutting edge; two holes are punched through the opposite end and a U-shaped piece of wire is inserted, after which the wire ring is attached to the ends, as indicated. In use, the tool is placed over the plant and the can pushed into the ground for a sufficient depth, the plant and a quantity of earth being withdrawn inside the can when it is pulled from the ground. The plants are transplanted into holes, made in the same manner, by holding the roots and earth surrounding them down with the wire loop with one hand and withdrawing the can with the other.



Making Lead Doll-House Furniture

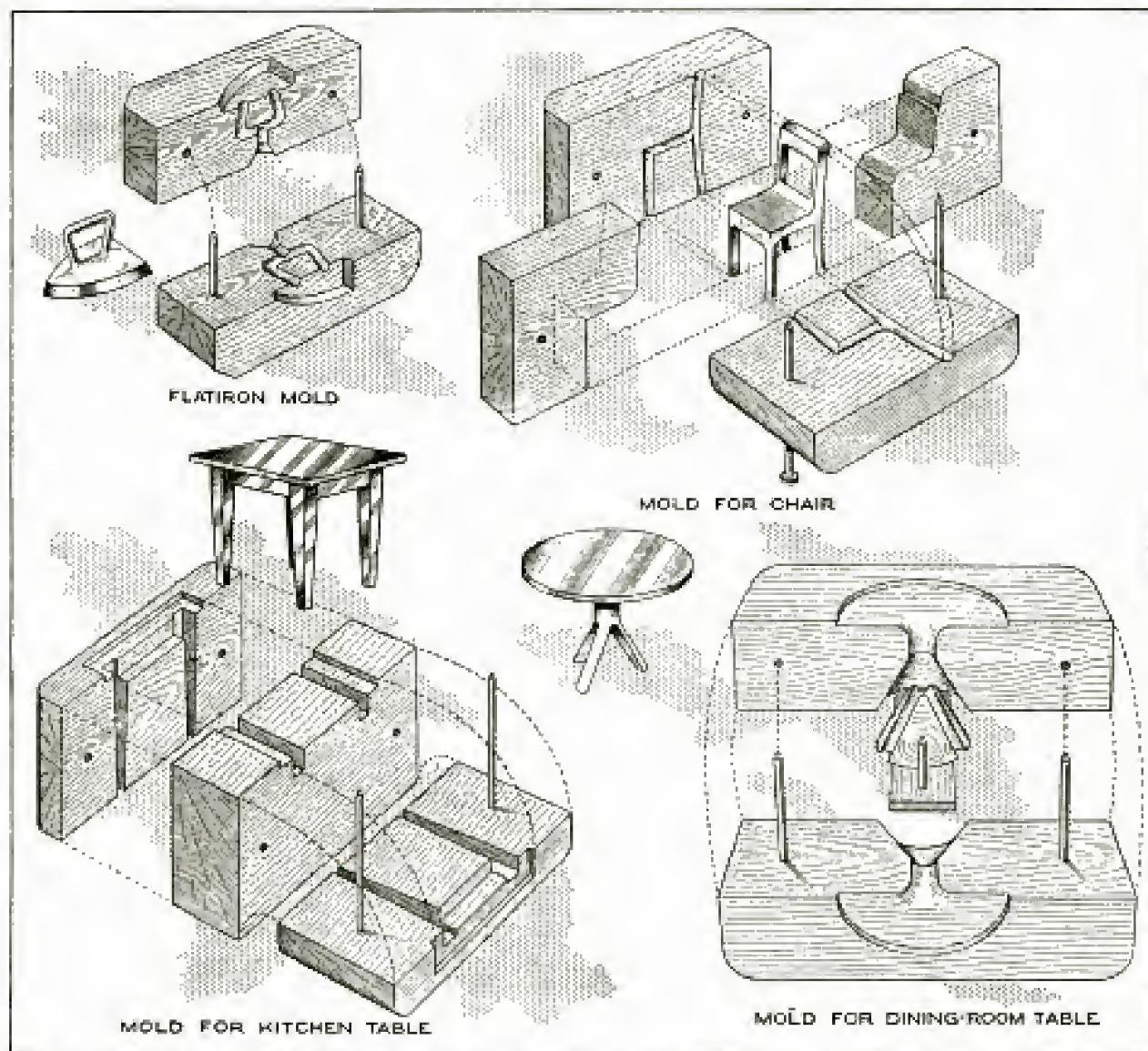
By E. H. TINGLEY

THE ease with which soft wood may be worked with simple tools, and the low melting temperature of soft lead, make an ideal combination for the boy who desires to produce metal toys. The tools required are a small plane, hammer, chisel, knife, and a ladle for lead. The lead can be obtained from any plumber, by asking for the short pieces of lead pipe to be found in the scrap pile.

For the mold, any soft wood, free from knots, may be used. Blocks, of a size suitable for the toy to be made, are planed square on all faces. The blocks forming each half of the mold should be planed

rated, and the design of the toy to be made drawn on the inner face of each block. Care should be taken that the design on each block will register with the other; that is, that they will come exactly opposite each other when the mold is closed. This may be accomplished by drawing reference lines across the top and ends of the blocks, when clamped together, separating the blocks, and drawing the lines across the faces.

When cutting out the molds, care must be taken to slope the sides of the cuts outward, giving them "draft," as a pattern-maker would say, so as to allow the pieces



Simple Molds for Making Lead Toys That can be Made by Any Boy with a Few Simple Tools: Scrap Lead Pipe, Obtainable from Any Plumber, Is the Material Used, and, with a Little Care in Making the Molds and Subsequent Trimming, Very Good-Looking Toys are Produced

to the same size, then clamped together, and holes, a little smaller than the diameter of the wire nails used as dowels, drilled clear through both, as shown in the drawings. The blocks are then sepa-

to be withdrawn from the molds without sticking. In making molds for tables, the tops should not be made too large or thick, as these molds are poured, top down, through the legs, and the lead will

not remain liquid long enough to run through the leg to the farthest corner of a large top. The parts of the toy must



Molds Used for the Flatiron, Kitchen and Dining-Room Tables and Chair, and Samples of the Toys Cast in Them

be proportioned with this in mind, and the lead kept hot, to secure good castings. The lead can be melted over the gas flame of the kitchen range, and a stove lid, heated fairly hot, used as a base for

casting. The molds should be held firmly together and down on the stove lid while pouring. It is necessary that a warm metal surface, such as the heated stove lid, be used as a base, else the lead will chill and spoil the work.

Lead remelted too often is not satisfactory for very small toys, as it becomes hard and brittle with repeated melting. The softer the lead, the easier it is to trim with a knife, to produce good-looking toys.

Other toys than those illustrated can be made by clever boys; dumb-bells, rocking-chairs, water pitchers, tenpins, etc., can be successfully produced. The method of making the molds is clearly shown in the drawings and photograph.

Vehicle Gate for a Driveway

The object shown in the photograph has not the appearance of the conventional gate, yet, set up in the middle of a private driveway, as shown, it prevents the passage of vehicles, but allows unobstructed access to pedestrians.



A 4-ft. length of 2-in. pipe, with horizontally projecting arms formed of pipe and fittings, rests in a socket imbedded in the cement driveway. A setscrew holds the "gate" tight. When a vehicle is to pass, the setscrew is loosened, the pipe is lifted out, and replaced when the automobile or carriage has passed.—Curtis Ralston, Chicago, Ill.

Driving Hornets from Nest

Hornets had built a nest in the eaves of a small garage, and their presence being undesirable, various means were tried to evict the potentially dangerous insects. A small plunger-type oil gun was filled with kerosene, and this was squirted onto the nest from a safe distance. The following day the nest had been completely evacuated.

The Care of Kerosene Lamps

Poor light is often caused by the condition of the lamps and wicks. The heavy oils that accumulate in the lamp should be thrown out every month, and the lamp thoroughly cleaned. Water should not be put in the lamp, nor should the wick be permitted to become damp. The lamp should be filled and cleaned, and the charred portion of the wick removed each time before lighting. Oil feeds to the wick better from a full lamp, and there is less danger of gas being formed in the lamp bowl. The wick is the vital part of the lamp, so it should be of good quality, of proper size, and long enough to reach to the bottom of the oil fount. New wicks should be supplied every month or two. They should be dried before the fire and put into the oil while still warm. Wicks clog gradually—clogged wicks make poor light; hence, economy in wicks is poor economy. A smoky flame may be due to a cheap burner, or to an unsuitable chimney. Burner and chimney should be kept clean. Burners may be cleaned by boiling with water to which a little soda has been added. Bad odors are almost always caused by heating and resulting evaporation of the oil on the outside of a dirty lamp or burner.

Kerosene dissolves various substances with which it comes into contact. These dissolved substances clog the wick, and the least water or moisture will make the

oil worthless. Keep the oilcan clean and dry. Good oil is sparklingly clear and brilliant.

So-called "safety powders," that are sold under the claim that they make the light brighter or prevent explosions, do not increase either the safety or illuminating power of the oil, and more than likely do positive harm by clogging the wick. They are usually sold with positive instructions to use clean oil, keep the lamp and wick clean, and the oil chamber full. If these instructions are followed, the result is a bright and safe flame, but the same result would be obtained by following the instructions—and throwing the powder away.

A Trailer for the Bicycle

Cultivating a three-acre garden tract six miles from home, the gardener built the bicycle trailer shown in the illustration to carry his tools and produce back and forth. The box body is a large wooden packing case mounted on a pair of stand-



A Bicycle Trailer, Built to Carry the Tools and Produce of an Amateur Gardener over the Six Miles between Home and Garden, has been Found Just as Useful When the Growing Season Is at an End

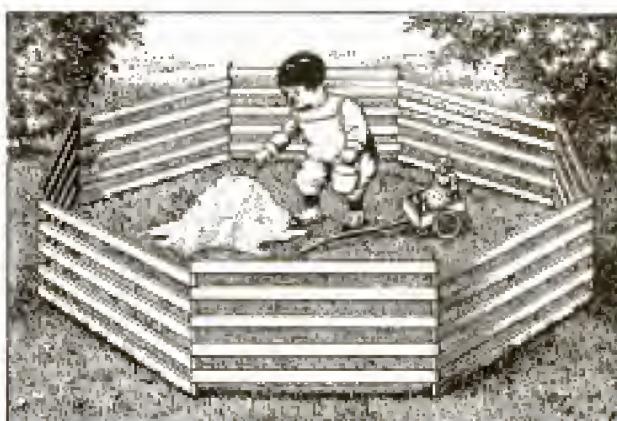
ard bicycle wheels. A 10-ft. length of pipe forms the connecting link with the cycle. After the growing season had come to a close, the owner used his trailer for hauling chicken feed, groceries, and similar loads.—Uri V. Averitt, Gary, Ind.

Testing Wool or Silk Goods

If a piece of goods that has been sold for all wool or genuine silk is suspected of being mixed with cotton or linen, the truth can be found by boiling a sample of the material in a five-per-cent solution of caustic soda for about five minutes. This treatment will boil out any silk or wool and leave the cotton or linen unchanged, if any is present. By weighing the sample before and after testing, the extent of the adulteration can be found.

A Simple Play Pen

A busy mother desired her baby to play out of doors as much as possible, but at the same time wished to restrain the

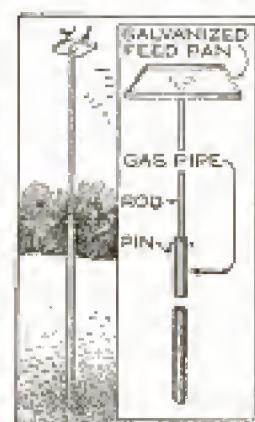


A Simple Form of Inclosure That Restricts the Movements of Its Juvenile Occupant is Made of Fruit and Vegetable Crates of a Familiar Type

movements of the child so that it would not wander off into possible danger. Being unable to keep a constant watch over the child, she evolved the simple form of inclosure illustrated. Certain fruits and vegetables are packed in crates made of a number of strips of wood joined together at the corners by lengths of heavy wire, passed through holes in the ends of the strips. Several of these crates were obtained and dismantled, then linked together at the ends to form a fairly large inclosure, which, when not in use, can be folded to occupy a small space.—Harry G. Schultz, Teaneck, N. J.

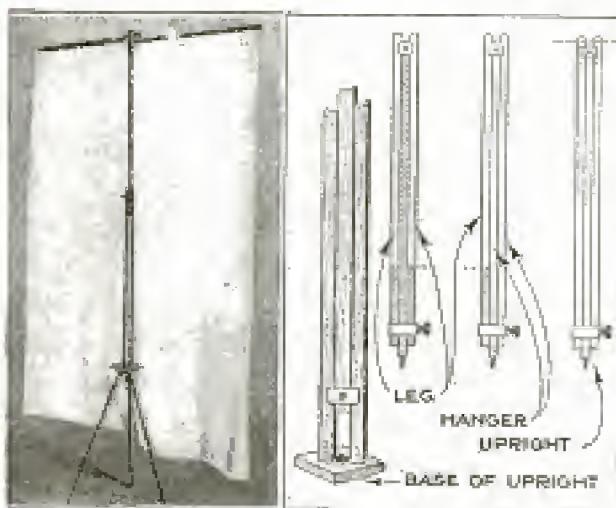
Feeding Tray for Birds

At several points about his thickly shrubbed and forested yard, a western business man and nature lover has installed feeding trays for his bird guests that remove them from the danger of cats, dogs, and other molesters. Lengths of pipe are set into the ground, and the galvanized-iron feeding trays are fitted to rods sliding in these. When the tray is to be filled, it is lowered, and when it is to be raised so that the birds may eat in safety, the rod is slid upward and a pin is inserted through a hole in the pipe, underneath the lower end of the rod.—Chas. A. Goddard, Los Angeles, Calif.



A Cheap Reflector for Home Photography

Good indoor portrait photography is impossible without a reflector, and a good one generally costs more than the aver-



A Reflector and Support That can be Made from an Old Camera Tripod will Equalize the Illumination and Reduce the Violent Contrasts of Light and Shadow

age amateur cares to pay. However, a very serviceable article can be made from the legs of an old camera tripod.

One of the old legs is sawed off to produce three pieces of equal length, about $1\frac{1}{2}$ ft. long, and these are hinged to the tripod head to make a short tripod. The screws that hold these legs should be screwed down tightly so that the legs will stay in the position in which they are placed. The upright is made from another of the tripod legs, and this requires no alteration other than squaring the rounded ends. A square block of wood, about $\frac{1}{2}$ in. thick, is screwed to the ends of this section to form a base. Between the two legs, a tripod socket from an old camera is imbedded in the block. This section, in use, is screwed to the top of the short tripod. For the horizontal hanger, from which the cloth reflector is suspended, the third section of the tripod has a short piece cut out of one of the side members. By loosening the setscrew, the hanger can be extended to about 3 ft. A loop of wire or cord should be fastened near the setscrew for hanging to the upright.

A piece of white cloth, about 3 by 5 ft., is used for the reflector, and a small pocket is sewed into each of the upper corners to slip over the ends of the hanger.

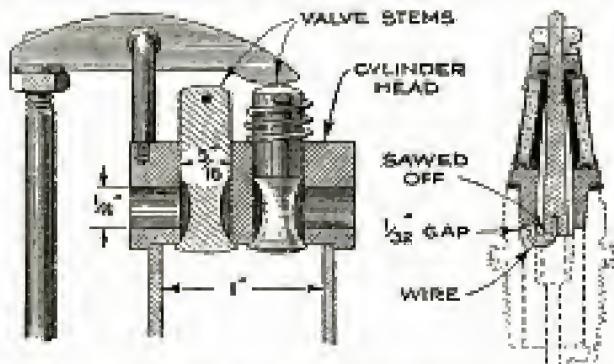
Blotting paper glued to the bottom of bric-à-brac prevents scratching polished mantels and sideboards.

Protecting Fruit Trees from Frost

Much of last year's fruit shortage, especially in the midwest and northern states, was due to the fact that the trees came into blossom earlier than usual, and were damaged by late-spring frosts. The method used by one fruit grower to avoid such a happening is worthy of note. While the ground in his orchard was frozen to a depth of several feet, he hauled the refuse from his barnyard and hayloft out, and spread it upon the ground under the trees, to a depth of 5 or 6 in. When the warm days of early spring followed, bringing neighboring orchards into blossom, his own orchard was as bare as it had been in the depth of winter. The heavy mulch of leaves and straw had held the frost underground, preventing the trees from budding. As soon as he was assured that all danger from frost was past, he removed the protecting mulch, and the trees came into blossom just late enough to miss the frost which destroyed the crops of other growers in his locality.

Hints for the Model Gas-Engine Builder

The maker of model gas engines is generally "up against it" when it comes to making valves in proportion to the size of



Simple Valves That will Operate Efficiently in a Model Gas Engine, and a Small Spark Plug That can be Made from Any of the Various Types of Separable Plug

the engine; also in trying to buy spark plugs of a corresponding scale on the market. A $\frac{1}{4}$ -in. valve, made in the proportions of the regular ones, would have a stem too thin for practical purposes, and, in addition, would be difficult to turn on the lathe. One way out of the difficulty is shown in the drawing; the valve stem was turned to $\frac{5}{16}$ in., for a 1-in. cylinder, and then cut away back of the head to make a passage for the gases, leaving a strong, durable valve. This makes it easy to machine the cylinder head, as it is only necessary to make seats for the valve

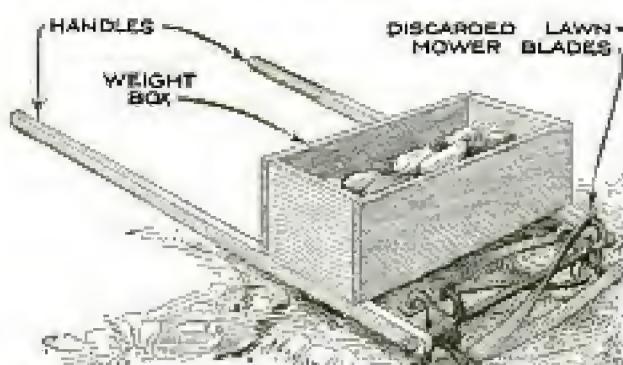
heads. The ports are drilled from the side, as shown.

There are several types of mica spark plugs on the market that are made separable to facilitate cleaning. Part of one of these may be used to make a neat plug for the model. The two parts of the plug are separated, and the long central electrode, or point, is sawed off at the point indicated, then drilled, and a piece of wire driven into the hole; this is bent to form a gap between it and the portion that screws into the cylinder. A gap of $\frac{1}{32}$ in. is sufficient. The miniature cylinder head is then drilled and tapped in the most suitable place to take the spark plug.—Edwin J. Bachman, Fullerton, Pa.

A Novel and Effective Garden Mulcher

Because a garden plot is free of weeds, it does not necessarily follow that it is sufficiently cultivated; if the soil becomes hard, packed by the rain, and baked by the sun, the vegetables or flowers will not thrive. Consequently it is absolutely necessary that the top soil be kept loose if the plants are to develop in the manner they should.

For this purpose a revolving mulcher, made from the cutter reel of a discarded lawn mower, will be found better and easier to operate than a hoe. Make a pair of handles from strong material, and mount the cutter reel across the ends of the handles. Just back of the handles a box is made to hold as many stones or

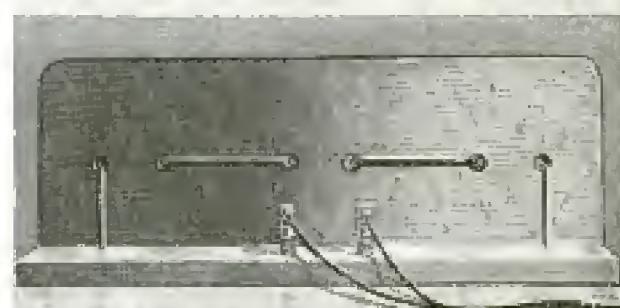


A Garden Mulcher and Weeder That can be Pushed Along between the Rows of Growing Plants is Easily Made from the Revolving Blades of an Old Lawn Mower

other weights as will be necessary to cause the mulcher to cut to the proper depth. In use the tool is pushed or pulled between the rows. The blades will revolve and cut into the soil and, due to arrangement of the cutters, the ground will be loosened and stirred up quite effectively.—G. E. Hendrickson, Argyle, Wisconsin.

Using Several Phones on Radio Receiver

The insistent demands of friends of the radio amateur that he entertain them at an evening of grand opera or musical



A Device for Connecting Several Sets of Phones to the Radio-Receiving Apparatus, Which is Located in Another Part of the Building, Making It Unnecessary for the Audience to Crowd into the Laboratory

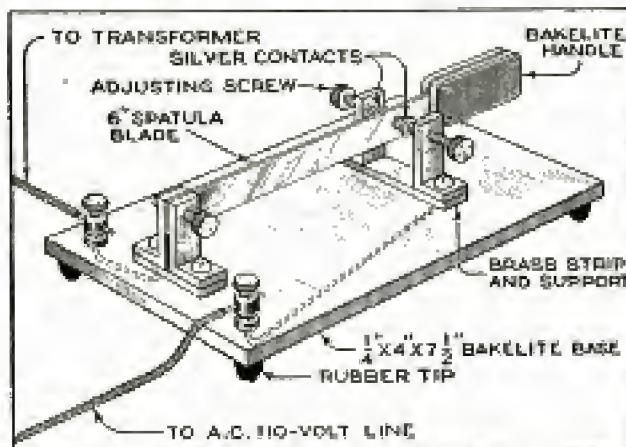
numbers generally present him with somewhat of a problem if he has but a single pair of phone terminals on his cabinet, and no loud-talking device. In the present case the placement of the phones in another room was also something of a problem. In order to connect the three sets of phones used, the device shown in the photograph was made. Two boards, each 18 in. long, and about 6 in. wide, were screwed together at right angles, and three pairs of binding posts were placed on the front and connected in series at the back. The connecting wires were then run underneath the base to the two binding posts at the rear. The lead from the phone terminals of the radio set were then run to the room and connected to the binding posts on the base.—W. J. McGuffage, Chicago, Ill.

Tire Chains for Emergencies

Repair sections for tire chains are obtainable for a few cents each, and these can be attached to the wheel of an automobile by stove bolts or wingnuts, without the necessity of jacking up the car. A few such sections, which should be long enough for their ends to meet when passed around the tire, placed on the rear wheels of the car, will furnish sufficient traction to enable it, in most cases, to be driven out of sand and mud.

How to Make a High-Speed Key

The "bug" or vibrating key has become quite popular with radio amateurs, and can no longer be considered the exclusive



A Vibrator-Type Transmitting Key for the Amateur Radio Operator, Which is Built Up from Easily Obtainable Parts, Makes It Possible to Develop Great Sending Speed

property of the commercial or professional operator. This type of key was first used by wire-telegraph operators to attain great speed, and, as it is easy to build and easy to operate, it is really a great improvement over the old-fashioned type of key. The movement of the key is from side to side instead of up and down, and with a little practice amazing speed in sending can be acquired. However, the operator should exercise some judgment, and not use so great a speed that he cannot transmit correctly.

The base, which is made of $\frac{1}{4}$ -in. bakelite, is supported on rubber feet to permit the wires to be run on the underside, as shown by the dotted lines on the drawing. The vibrator, or blade, can be made from any of various materials, such as a thin, flexible nail file, hacksaw blades, and the like, although an artist's spatula, as shown in the drawing, makes an ideal blade. The original handle of the spatula is removed, and two strips of bakelite are cut to form an insulating handle, which is held together by small machine screws, so placed as not to come into contact with the blade. A $\frac{1}{8}$ -in. hole is drilled near the other end of the blade, which is supported between brackets of the type shown; these are formed from $\frac{1}{8}$ -in. sheet brass, and the blade is securely fastened between them by a screw. Machine screws are used for attaching the brackets to the base. The front brackets, near the handle, are made of the same material and to the same dimensions as those holding the blade at the rear. These brackets are mounted on a brass strip, and each is

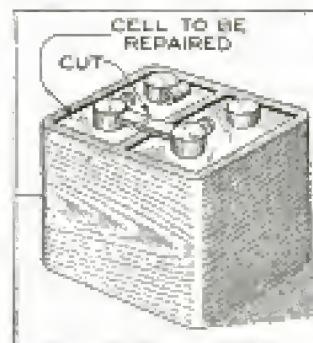
provided with a knurled-head screw, as indicated. Coin-silver contacts are soldered to the tips of these screws and to the blade, at the points where it makes contact with the screws.

Adjustments are easily made when the blade is in position, by merely turning the thumbscrews. When the key assembly is completed, one wire is led from the base of the contact-point brackets to one of the binding posts, and another is led from the supporting brackets at the end of the blade to the second binding post. Owing to the fact that the steel blade always tends to straighten itself no switch is needed, because, if the contact points are adjusted to a uniform distance from the blade, it will not come into contact with them when not in use. After the wiring is completed, and the terminals soldered, the key is ready to be connected in series with the supply line leading to the transformer.—F. L. Brittin, Chicago, Ill.

Repairing Storage Batteries

Storage batteries may be repaired without the trouble of removing the jars from the case, and without melting the cross-bars in order to remove a set of plates. A diagonal cut is sawed in the connecting bar, as shown, and the plates of the defective cell are lifted out after the sealing compound has been sufficiently softened.

After the plates have been repaired or the separators renewed, the crossbar is carefully soldered together. To facilitate soldering, the ends are pried up slightly and a piece of wood, or a piece of an old separator, is slid under the cut, which is then cleaned, fluxed, bent back into place, and soldered.



Removing Spots from Varnished Surfaces

To remove white spots from a varnished surface, make up, in the proportions given, the following mixture: raw linseed oil, $\frac{1}{2}$ pt.; turpentine, $\frac{1}{2}$ pt., and denatured alcohol, $\frac{1}{2}$ pt. Shake well until thoroughly mixed. Dampen a piece of cheesecloth with this mixture and rub the spots several times, or until they disappear. If tightly corked, the mixture will keep indefinitely.

PRIZE OFFERS

8656 8650 MANY PRIZES FOR POSTERS AND ESSAYS TO INCITE KINDNESS TO ANIMALS

For the best humane posters and essays illustrating the idea of kindness to animals or human beings, numerous cash prizes are offered by the American Humane Association, Albany, N. Y. This is the national contest that succeeds the state contests, similar to the one for Massachusetts, announced last month in this magazine. The national contest is open to everyone, everywhere. It is divided into eight groups, as follows: group 1, for school grades 1-4; group 2, for school grades 5-8; group 3, for high-school grade 9; group 4, for art students, and anyone not in other groups; groups 5 and 6, for any person born before May 30, 1903; groups 7 and 8, for any person born after May 19, 1903. In each group there will be three prizes: first, \$25; second, \$15, and third, \$10. Special prizes of \$10, \$5, and \$3 in groups 6 and 8 will be awarded for the best cartoons with the words "Be Kind to Animals" published in any newspaper or magazine. Three additional prizes, open to all groups, will be awarded for posters or humane essays by pupils in U. S. Indian schools; also a prize of \$25 will be given by the American Society for the Prevention of Cruelty to Animals, New York City, for the best poster suitable for publication by their society, and two other prizes of \$10 and \$5, given by the Pennsylvania Society for the Prevention of Cruelty to Animals for the best posters showing the cruelty of trapping animals for furs.

The rules of the contests are as follows: A competitor may submit any number of posters, maximum size 22 by 28 in. Group number in which poster is entered must appear on front and back of each drawing, with name and address of artist on the back alone. Posters must be sent, wrapped flat, carriage paid, to the Poster Department, American Humane Association, Humane Society Bldg., Albany, N. Y., so as to be received not later than May 20, 1922.

Besides the above prizes, others are offered for essays, to be mailed not later than 6:00 p. m., May 30, to the Association's Essay Contest Department, as follows: three prizes of \$25, \$15, and \$10, given by the San Francisco Society for the Prevention of Cruelty to Animals for the best essays written by Boy Scouts on the protection of animals—open to Boy Scouts everywhere; also \$30, given by the National Association of Audubon Societies, of which \$25 will be awarded to a Campfire Girl and \$25 to a Girl Scout for the best essays on the protection of birds. In these contests, essays must not exceed 800 words in length, and must be signed with the author's name and address.

8686 FOUNDATION TO HELP TOWNS ESTABLISH PLAYGROUNDS

Of interest to every town and city in the country is a new foundation, established in New York by William F. Harmon. The corporation is to be known as the Harmon Foundation, and has for its object the application of sound business principles to many social movements, such as helping towns to establish playgrounds, and in advancing loans to college students through the organization of mutual-aid societies. The foundation will be guided by the principle of helping people to help themselves. For the present the entire time of the staff is being spent in helping towns to establish playgrounds, but later on divisions of vocational guidance, and of counsel to social organizations in financial matters, will be organized.

American City 2/1922-8128 NEW INDUSTRIAL MACHINERY DIVISION 8657 IN DEPARTMENT OF COMMERCE

In the Bureau of Foreign and Domestic Commerce there has been organized the Industrial Machinery Division to provide American manufacturers of machinery with adequate government assistance. The new division will give attention to every kind of machinery in any branch of industry. In order that the division may be thoroughly practical in its work, men who

are qualified engineers and who have sold a great variety of machinery for a number of years in South America and Asia have been placed in charge. The division aims to be of the greatest possible service to American manufacturers and exporters of machinery, and with this object in view, will establish as close contact as possible with these interests. An explanatory pamphlet has been published by the division.

8590 FOUR YEARS' UNIVERSITY SCHOLARSHIP OFFERED HIGH-SCHOOL STUDENTS

For the third consecutive year, a four years' university scholarship is being offered to high-school students to encourage them in the study of highway economics, according to an announcement issued by the Highway and Highway Transport Education Committee. The scholarship is awarded for the best essay on the subject: "How Good Roads are Developing My Community." Essays are not to exceed 700 words in length, and must be in the hands of a high-school teacher or principal not later than May 1. All students of high-school grade, including both public and private schools, are eligible to compete. Essays must be written in proper manuscript form, with the name, school, and home address of the contestant in the upper left-hand corner of the first page.

Complete rules of the contest, a bibliography, suggestions, and other information may be obtained by applying to the Highway and Highway-Transport Education Committee, Willard Building, Washington, D. C.

8665 AMERICAN CERAMIC SOCIETY OFFERS AID IN RESEARCH WORK ON GLASS

For the encouragement of research work on glass, the research committee of the Glass Division of the American Ceramic Society offers to supply glass of any desired composition and form, free of charge and without limitation, to investigators in this field. The only obligation put upon the recipient is that of publication of the result of his investigations, preferably in the journal of the American Ceramic Society. Persons interested are requested to address one of the following members of the committee on research: E. C. Sullivan, Corning Glass Works, Corning, N. Y.; E. W. Washburn, University of Illinois, Urbana, Ill.; or R. B. Sosman, Geophysical Laboratory, Washington, D. C.

8523 Science 3/10/22

MANY VALUABLE PRIZES TO BE AWARDED TO FOSTER BETTER-BRED LIVE STOCK

To stimulate the production of better-bred live stock, \$5,000, divided into 35 prizes, is to be awarded at the cattle show to be held in November at the Bourbon Stockyards, Louisville, Ky. Entries will be open to all farmers and breeders of Kentucky, Tennessee, Georgia, and Alabama. There will be fat-cattle, as well as steer and feeder awards. For the encouragement of boys' and girls' clubs formed for feeding cattle, a special class has been added to the show, in which prizes will be awarded of a value of \$1,500. Anyone desiring more information should write to the Bourbon Stockyards, Louisville, Ky.

Clipping Service PRIZE FOR BEST NAME FOR A MACHINE THAT SAVES WOODWORKING LABOR

For the best name for a new woodworking combination machine that saws, planes, bores, grooves, makes miters, and is handy for all kinds of repair work, a prize of \$100 is offered. The contest is not limited to woodworkers, and everybody is eligible to send in any number of suggestions. The name should be descriptive of the machine, and easy to remember. It must be received by May 1, 1922, written clearly with sender's name and address on any postal card or piece of paper, and addressed to Advertising Department, Huntington Manufacturing Co., Norristown, Pennsylvania.

Central Press Clipping Service 2/23/22

816

POPULAR MECHANICS

GOOD TASTE IN MUSIC CULTIVATED BY MUSIC-MEMORY CONTESTS

Very popular, and in practice in a large number of schools now, is a form of contest that cultivates good musical taste in the school children and others. It is called a "music-memory contest." The object of these contests is to cultivate an appreciation of good music, and they are promoted by musical and literary clubs in cooperation with the schools. The method of procedure is to select some 30 or 40 classical-music numbers. These are played and sung before the contestants, and interesting information regarding them and their composers is told to the audience, whose business it is to make notes, and memorize it. This continues for about two months, when the examinations begin, to determine which of the contestants recognizes the music, upon its recital, and can give the best account of its origin and its composer.

sities are awarding more valuable prizes than others, and this naturally attracts the "tramp athlete." If all schools and colleges would agree on standard awards, preferably in the form of medals, the tramp athlete would soon be a thing of the past.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute.

For Service to City of Philadelphia: Prize \$10,000; announced September issue, 1921; awarded in spring or summer of 1922 by Edward Bok, former editor of The Ladies Home Journal.

Model in Clay by Students of Chicago Art Institute: Prizes, \$1,000, \$100, and \$50; announced November issue, 1921; closes April 15, 1922; address, Daily News Office, 15 N. Wells St., Chicago, Ill.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France.

Best Slogan Describing Razor: Prize \$500; announced January issue, 1922; closes June 30; address, Durham Duplex Razor Co., 190 Baldwin Ave., Jersey City, N. J.

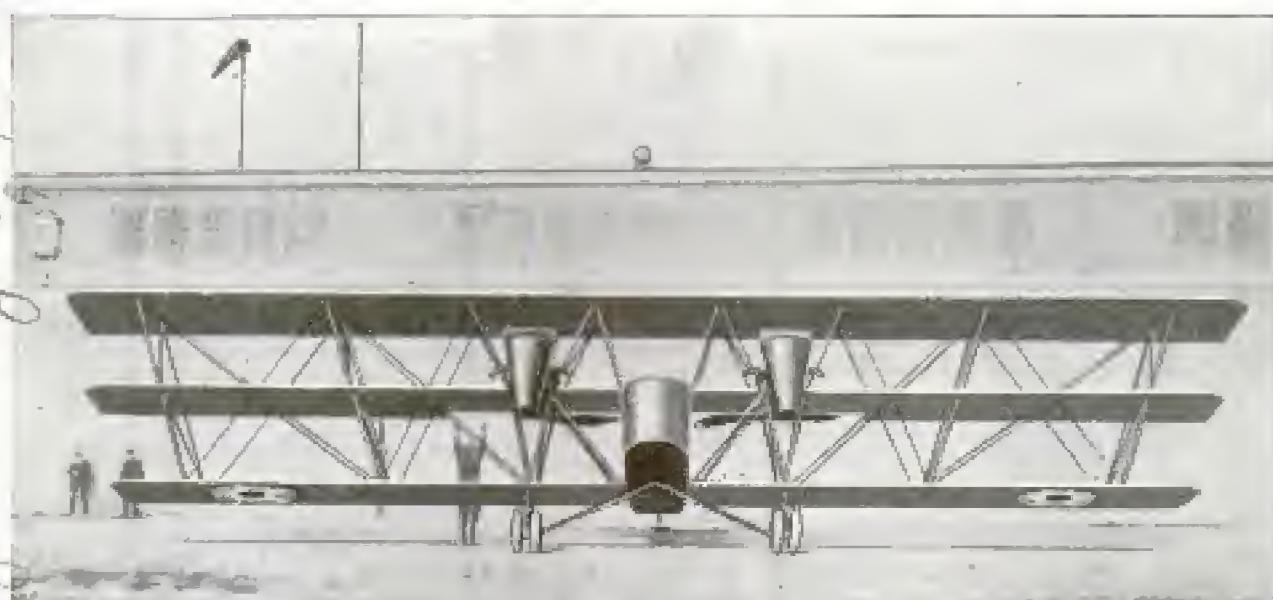
American-History Essays: Prizes, \$3,000 for professors, \$2,000 for specialists, \$1,000 for school-teachers, \$1,000 for students, and \$500 for undergraduates in U. S. colleges; announced March issue, 1922; closes May 31. Address, Knights of Columbus Historical Commission, K. of C. Bldg., 199 Massachusetts Ave., Boston, Mass.

Best Setting of a Song: Prize \$100; announced April issue, 1922; closes July 1, 1922; address, D. A. Clippinger, 617-18 Kimball Building, Chicago, Ill.

Man-Propelled Airplane: Prize 20,000 francs; announced April issue, 1922; closes September 15, 1922; address, Maison Peugeot, 80 Rue Danton, Levallois-Perret (Seine), France.

In answering prize offers please mention Popular Mechanics Magazine

8524



ARMORED TRIPLANE CARRIES ONE CANNON AND SIX MACHINE GUNS

THE latest development in American aviation is this triplane in which all vital parts are protected by armor. As armament it carries a cannon firing a one-pound shell, and has also six machine guns which can be fired in practically all directions. In addition, it carries 10 bombs, and when fully loaded weighs almost five tons. It has a flying speed of 105 miles per hour and a climbing speed of 600 ft. per minute.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

Patel & Herbert Press Service
Central Age Weekly 2/27/22

**10 Days'
Free
Trial**

**Small
Monthly
Payments**



\$4 first payment buys this Brand-New Typewriter

**Pay the balance in small monthly installments—
We will ship the typewriter to you for ten days' free trial**

The Amazing Story

A real need has long existed for a full-size, 4-bank, 42-key, 84-character-keyboard typewriter, with the entire line of writing completely visible, selling for less than \$100.

Annell has been evolved to fill that need: it is the creation of, and is sponsored by, men who know every phase of typewriter manufacturing and typewriter use.

The Annell turns out the most beautiful work that ever came from a writing-machine. The type is clear, clean-cut, hard; the alignment and spacing are utterly perfect. The speed is unlimited, no operator can crowd the Annell. Above all, this Model No. 3A Annell is of extremely simple construction. It is trouble-proof and sturdy; it is free from devices which without adding real writing value complicate the mechanism. It will last a business lifetime.

Every Operating Feature

The Annell has every late style feature and modern operating convenience—each letter completely visible as written (together with all the previous writing), Back Spacer, Tabulator, Two-Color Ribbon, Right and Left Hand Shift Key, Shift Lock, Margin Release, Adjustable-Line Spacing, Adjustable Margin Stops, Paper Release, Automatic Line Spacer on Carriage Return, Adjustable Paper Fingers, etc., also the 42-key, 84-character Universal Keyboard, Rubber Cover and all extras shipped with each machine.

The operator of any Universal Keyboard machine can easily change to the Annell because the keyboards have the same relative position of the letters.

The Annell is Standard in size, Standard in appearance, construction and mechanical action—a typewriter that honestly reflects the great lessons learned from years of typewriter experience, with an action so smooth and a touch so responsive as to be a source of constant pleasure to the experienced operator, and making the progress of the novice immeasurably easier.

An Immense Saving

Our wonderful machine and remarkably low price are astounding the typewriter world. Never before in the history of the typewriter business has so much real, honest writing value been offered at so low a price. We are the only company selling a Standard 42-Key, 4-Row, Brand-New Typewriter direct to the user by mail at practically the wholesale price of other high-grade typewriters.

Typewriter users who once paid around \$100 for typewriters are now buying the Annell; they appreciate its sturdy day-after-day dependable performance and ease of operation. You can pay more for a typewriter, but you cannot get more writing value at any price than in the Annell. *Absolute reliability, the utmost quality, at a lower price.*

Through this advertisement I want to establish as friendly business relations with you as I possibly can. I want you to realize that it is our earnest effort and intention to give you full honest value for every dollar that you spend with us. That is the only way we can continue to succeed. I have been selling typewriters by mail direct to the user through magazine and direct advertising for over twelve years. During this period I sold over 60,000 typewriters of various makes, in all classes of users from the Government down, and I am very proud, indeed, to offer to you our beautiful up-to-date latest style, brand-new Annell typewriter.

Our business is on the foundation of exceptional value at lowest prices—and square dealing. We are saving thousands of satisfied customers thousands of dollars by supplying these perfect, latest style, new typewriters at such unusually low prices.

All our transactions are handled throughout by personal correspondence. You will receive every courtesy and consideration in your dealings with us. I give you my personal assurance that you will receive a remarkable and honest writing value by making your typewriter investment with us. Your response to this offer will have prompt, careful personal attention. We will be glad to do business with you.

Harry Annell Smith

Over a Year to Pay

Our remarkably low price, together with our convenient monthly payment plan, makes it possible for you to buy a brand-new typewriter easily and without inconvenience—over a year to pay, \$60.00 for this beautiful writing-machine—\$4.00 with your trial order, then \$3.00 monthly in advance. Cash Price, \$64.35—\$4.00 with trial order, \$60.35 after ten days' trial. This \$4.00 deposit and any express charges you have paid will be returned to you if you are not satisfied with the typewriter.

Fully Guaranteed

The Annell is built to watchmaking standards, just so perfectly; from the best of materials money and brains can buy; patterned along proven, standard design; using the best workmanship and the most modern factory equipment obtainable. Yet we absolutely protect you with an iron-clad guarantee against any flaw in the material or workmanship. Annell is built to assure reputation—for leadership.

No Risk—10-Day Free Trial

The high-grade quality of this beautiful machine is even better than we can tell you, or show in pictures; we will prove this to you by sending the machine to you for ten days' trial. You use the machine on any of your work and satisfy yourself that this typewriter will do your work to your complete satisfaction—satisfy yourself that the Annell is the best typewriter value offered today by anybody, regardless of price. If you are not entirely satisfied after trying it thoroughly, return the machine to us. We will refund the express charges and any money you have paid, and the trial will cost you nothing. You are the only judge. Nothing could be more fair.

Send for Information, or Send the Coupon

A postal from you brings free and postpaid all the interesting facts of how you can receive the utmost in writing value, at an immense saving from the usual typewriter prices. Or send the coupon for the typewriter and make the real test.

At present we can make prompt delivery, but our volume of orders is increasing rapidly and will soon tax our factory capacity. Better act now, it does not obligate you. Mail coupon today—don't delay.

ANNELL TYPEWRITER COMPANY
1901 First National Bank Bldg., CHICAGO

TEAR OUT AND MAIL

ANNELL TYPEWRITER CO., 1901 1st Nat. Bank Bldg., Chicago.

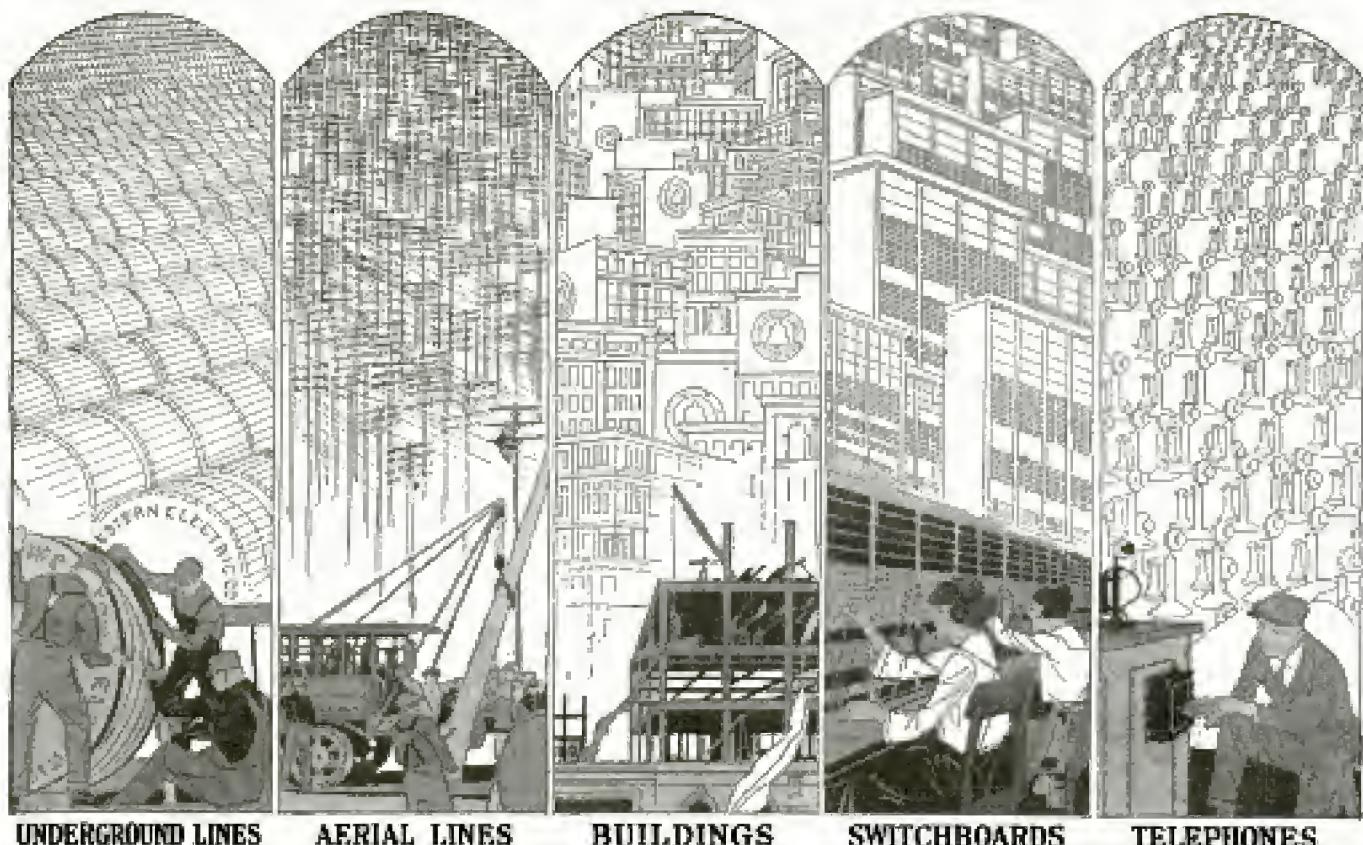
Enclosed \$4.00 deposit, as evidence of good faith. Ship me the Annell Typewriter on Ten Days' Free Trial. This does not obligate me in any way to buy the machine.

Name _____

Address _____

DIVE REFERENCES ON MARGIN

P.M.



UNDERGROUND LINES

AERIAL LINES

BUILDINGS

SWITCHBOARDS

TELEPHONES

Breaking Construction Records

Since 1920, faced with the greatest demand for service in telephone history, the Bell System has surpassed all previous records for the installation of new telephone equipment. In the last two years more than 1,000,000 additional stations have been added to the system by construction. This is equal to the entire number of telephones in Great Britain.

In 1921 alone, 450,000 new poles were placed—enough to make a telephone line from New York to Hong Kong. The aerial wire put into service in the same year, 835,000 miles in all, is enough to string 60 wires on such a telephone line.

1,875,000 miles of wire, enclosed in 1,500 miles of cable, were added

to underground and submarine lines in 1921. New underground duct totaling 11,000,000 feet was constructed, this representing approximately 300 miles of subway. 69 new central office buildings and important additions were completed or in progress, and new switchboards with a capacity of many thousands of connections were installed.

This equipment added to the Bell System, great though it is in volume and value, represents but a small part of the vast property which enables the telephone on your desk to give the service to which you are accustomed. And to meet the increasing demands for new service, the work of construction goes on.

"BELL SYSTEM"

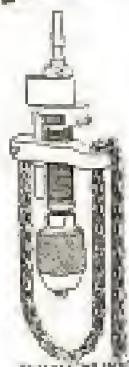
**AMERICAN TELEPHONE AND TELEGRAPH COMPANY
AND ASSOCIATED COMPANIES**



One Policy, One System, Universal Service, and all directed toward Better Service



Less labor in drilling when you use the right tools



"Impossible" drilling jobs become simple—all drilling jobs become easier with these ingenious "Yankee" drills. And the work is done quicker and better.

For doing away with hand feeding

"YANKEE" Chain Drill No. 1500 with automatic friction and ratchet feed

All you do is turn brace. Chain is tightened and drill quickly set to the work by "Yankee" Friction Feed; then automatically fed at exactly right pressure by "Yankee" Ratchet Feed. Saves drills. Three-jaw chuck for round shank drills up to $\frac{1}{2}$ in.

For awkward places where other drills won't work

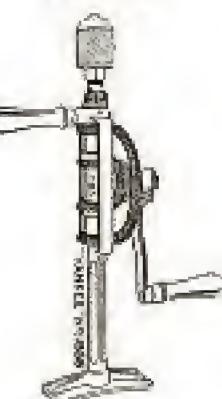
"YANKEE" Ratchet Breast Drill No. 1555

"Yankee" DOUBLE Ratchet keeps drill cutting continuously in places where you can move crank handle only an inch in either direction. Five adjustments; plain drill, left-hand ratchet, right-hand ratchet, DOUBLE Ratchet, gears locked. Speed can be changed without removing drill from work. Length 17 in. Three-jaw chuck for round shank drills up to $\frac{1}{2}$ in.

For small holes in tight quarters

"YANKEE" Ratchet Hand Drill No. 1530

Only $10\frac{1}{4}$ in. long. Weighs only $1\frac{1}{4}$ pounds. Yet has all five adjustments of big "Yankee" Drills. Holds drills up to $\frac{3}{16}$ in.



Some other "Yankee" Tools Tool Book Tools FREE

Quick-Return Spiral
Ratchet Screw-drivers
Ratchet Beach Drills
Automatic Push Drills
Ratchet Tap Wrenches

Illustrates and
describes all the
"Yankee" Tools
for saving time
and labor.



Dealers everywhere sell "YANKEE" Tools

NORTH BROS. MFG. CO.

Philadelphia

"YANKEE" TOOLS

make Better mechanics



"Comfort—from neck to knee"

WHY didn't somebody make an athletic union suit like Topkis long ago? "Look at the long, wide legs! You can walk all day in Topkis without ever feeling a pinch or a pull. Scarcely touches your body. Big, roomy armholes.

"And listen—Topkis lets your skin breathe. No stuffy feeling.

"Quality? Value? Feel that fabric. Look at the workmanship. Seams firmly stitched; buttons put on to stay. Where could you get anything like it for a dollar except in Topkis?"

Only the best nainsook and other high-grade fabrics are used in Topkis Athletic Underwear. Pre-shrunk—full size guaranteed. But get your size—38 if your coat is a 38, and so on.

No good dealer will ask more than a dollar for the Topkis Men's Union Suit—but many will tell you it's worth more.

Men's Union Suits, \$1.00.

Men's Shirts and Drawers, 75c per garment. 75c for Boys' Union Suits, Girls' Bloomer Union Suits, and Children's Waist Union Suits.

TOPKIS BROTHERS COMPANY, Wilmington, Delaware

General Sales Office: 350 Broadway, New York City

*Ask for TOPKIS Underwear.
Look for the Topkis label.*

*Illustrated booklet tells underwear facts
you ought to know. Write for free copy.*



Copyrighted material

TEN-SHAVE TEST TUBE FREE—SEND THE COUPON

*If YOU were
inventing a
shaving cream-*

YOU would decide that your shaving cream would have to meet seven requirements:

- 1 A smooth, quick-spreading cream.
- 2 Instant lather with either hot or cold water—rich, luxurious, soothing.
- 3 Quick, easy beard-softening.
- 4 A shave with one lathering.
- 5 A comfortable, velvety skin after shaving. No delicate outer layer of cuticle or natural oil removed.
- 6 No after irritation or roughness. Just the firm, even texture of perfect skin health.
- 7 A sensible screw top to the tube—big enough to handle with wet fingers and flat enough to stay where you put it.

**Three Years of Experiment to Create
The Perfect Shaving Cream**

No shaving cream you've ever used would satisfy all of these requirements, of course. For more than three years, too, it looked as if our chemists could not compound a shaving cream which would make good on all of them.



But we had a quarter of a century of research and experience with the tenderest skins in the world to guide us. So we kept on trying. Finally we got what we wanted—what you, too, have wanted every time you have tackled your morning shave.

Send Coupon for Free Sample

That's Melba Shaving Cream. We are so sure that it will do everything you ask of a shaving cream, that we are spending a good many thousand dollars to put a ten-shave trial tube into the hands of America's self-shavers. Your tube is waiting for you. Fill out and send the attached coupon. Then "just lather and shave."

M E L B A
SHAVING
CREAM

F R E E C O U P O N

MELBA MFG. CO. P.M.
4235 Indiana Ave., Chicago, Ill.

Please send me the free ten-shave trial tube of Melba Shaving Cream.

Print plainly in pencil

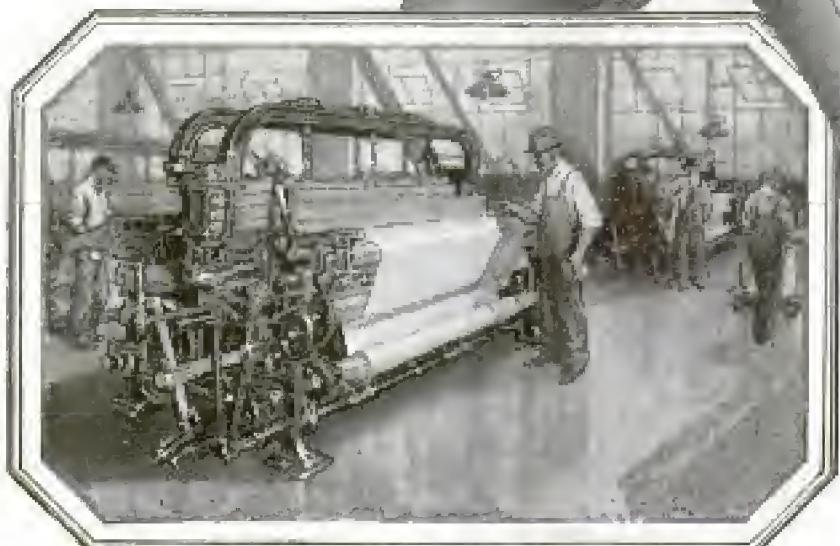
Name _____

Street No. _____

City _____

State _____

Weaving the giant rolls of strong, flexible fabric which plays so important a part in the high quality of your Vitalic Bicycle Tires.



"Tougher than Elephant hide" -because special 14½ ounce fabric

DID you ever see a kite string break? It was caused by too great a strain on a weak spot.

When you spin along on your Vitalic Bicycle Tires, each thread in the strong fabric gets many times the abuse a kite string receives. Yet Vitalic fabric must not break.

Only the very finest fabric can stand such

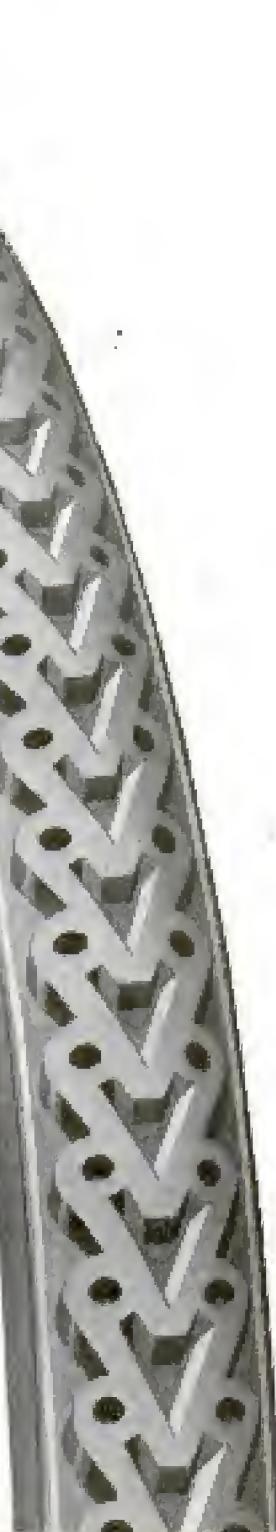
treatment without being injured. And Vitalics are not only built to withstand the shock, but to absorb it, so it does not reach the rider.

There are good, sound reasons why the makers of such good bicycles as Black Beauty, Columbia, Dayton, Emblem, Excelsior, Indian, Iver-Johnson, Pierce and Yale use Vitalics on their better grade wheels.

CONTINENTAL RUBBER WORKS
1930 Liberty St.
Eric, Pa.



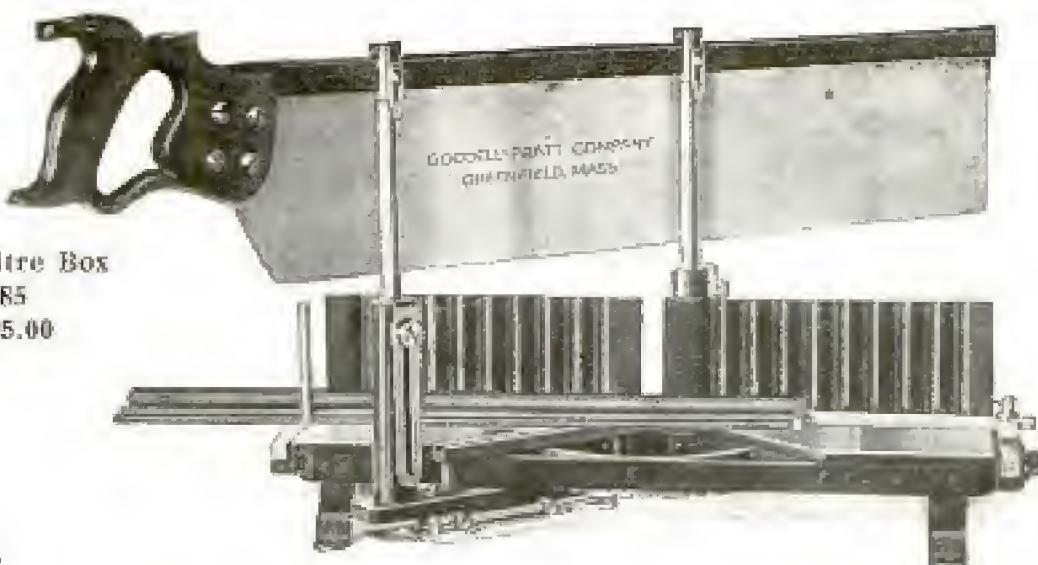
*Send for this
free booklet
—and learn all
about the spe-
cial fabric used
in your sturdy
Vitalics.*



VITALIC TRADE MARK REGISTERED Bicycle Tires



*TRADE MARK
Tougher than
elephant hide.*



All Steel Mitre Box
No. 1285
Price, \$25.00



Mr. Punch Says: Men, here's a Mitre Box as true as your best friend!

"It lets you make a clean, thin cut at any angle you want. It holds rigid the piece of wood you're working on, and it couldn't splinter it even if it wanted to. When your job's done, the edges are smooth and true."

This Goodell-Pratt All-Steel Mitre Box is trussed like a steel bridge. Saw can be locked at any angle, and is held by a spring that can be released by a slight downward pressure. Stops are easily regulated to permit sawing to any desired depth.

You don't buy tools very often. When you do, you expect them to last a long, long time. That is why it is so well worth your while to remember Goodell-Pratt 1500 Good Tools—it's a name that stands for all that's trustworthy and accurate in tools.

You will find them at those hardware stores where high-grade tools are known and appreciated.

Write for free booklet showing hundreds of different tools for carpenters, mechanics, artisans and home "putterers" who take pride in what they can do with their two good hands.

GOODELL-PRATT COMPANY, Greenfield, Mass., U.S.A.

Toolsmiths,



GOODELL-PRATT
1500 GOOD TOOLS



The Price You Pay For dingy film on teeth

Let us show you by a ten-day test how combating film in this new way beautifies the teeth.

Now your teeth are coated with a viscous film. You can feel it with your tongue. It clings to teeth, enters crevices and stays. It forms the basis of fixed cloudy coats.

Keeps teeth dingy

Film absorbs stains, making the teeth look dingy. Film is the basis of tartar. It holds

food substance which ferments and forms acids. It holds the acids in contact with the teeth to cause decay.

Millions of germs breed in it. They, with tartar, are the chief cause of pyorrhea. Thus most tooth troubles are now traced to film. And, despite the tooth brush, they have constantly increased.

Attack it daily

Careful people have this film removed twice yearly by

10-Day Tube Free

THE PEPSODENT COMPANY,
Dept. 872, 1104 S. Wabash Ave., Chicago, Ill.
Mail 10-Day Tube of Pepsodent to

Only one tube to a family

their dentists. But the need is for a daily film combatant.

Now dental science, after long research, has found two ways to fight film. Able authorities have proved their efficiency. A new-type tooth paste has been perfected to comply with modern requirements. The name is Pepsodent. These two film combatants are embodied in it, to fight the film twice daily.

Two other effects

Pepsodent also multiplies the starch digestant in saliva. That is there to digest starch deposits which otherwise may cling and form acids.

It multiplies the alkalinity of the saliva. That is Nature's neutralizer for acids which cause decay.

Millions employ it

Millions of people now use Pepsodent, largely by dental advice. The results are seen everywhere — in glistening teeth,

Once see its effects and you will adopt it, too. You will always want the whiter, cleaner, safer teeth you see. Make this test and watch the changes that it brings. Cut out the coupon now.

**PAT. OFF.
Pepsodent**
REG. U.S.

The New-Day Dentifrice

Endorsed by modern authorities and now advised by leading dentists nearly all the world over. All druggists supply the large tubes.



Corona can help you to increase your output and income, just as it has hastened the success of thousands upon thousands of ambitious men and women. Send for the free booklet today.

"Corona has been my helper for nine years!"

THIS wonderful little typewriter has aided me in my business, increased my income, made school-work easier for my children, been private secretary to my wife—and in nine years of the hardest kind of use has cost me but thirty-five cents for repairs!" — W. E. Conklyn, Yonkers, N. Y.

At home, at the office, at school, or on a journey 'round the world, this tireless little "secretary" is always ready to help you turn out more and better work.

The sturdiest of all typewriters

Corona was designed from the beginning as a *portable* typewriter. It is built so strongly and so simply that it practically never gets out of order. And its construction has been proven sound by sixteen years of actual use.

CORONA

The Personal Writing Machine

REG. U. S. PAT. OFF.

CORONA TYPEWRITER CO., Inc.
108 MAIN STREET GROTON, N. Y.

Send for the free booklet

It is full of the actual experiences of men and women whom Corona has helped to success in many lines of endeavor.



Mail this
Coupon for
booklet
No. 8. Address
Corona Typewriter
Co., Inc., Groton, N.Y.

Name _____

Address _____

Fold it up—take it with you—typewrite anywhere



LOOK

21 Perfect Jewels
Adjusted to Positions
Adjusted to Temperature
Adjusted to Isochronism
Adjusted to the Second
Thin Model All Sizes

Santa Fe Special Watch

Guaranteed to last a lifetime and give satisfactory service. Is NOW being sold at Rock Bottom Prices and on easy payments.

Send for **Free** Watch book and select your watch.

The ILLINOIS Famous \$
Santa Fe Special **350**
21 JEWEL RAILROAD WATCH **3** MONT

The Standard Railroad Watch

THIS IS GUARANTEED FOR A LIFETIME OF SATISFACTORY SERVICE. These watches are now in service on practically every railroad in the United States and in every branch of the Army and Naval service. Thousands of them are distributed around the world. Your name or monogram and any emblem you may desire will be engraved in the case to suit your own ideas. Write today for my Free Watch Book—make your selection now. Save One-Third to One-Half the price you pay for a similar watch made by other manufacturers. Most liberal Offer Ever Made. Our "Direct-to-You" low wholesale terms and Extra Special Distribution Plan is fully explained in the New Santa Fe Special Booklet just off the press. The "Santa Fe Special" Plan means a big saving of money to you and you get the best watch value on the market today. Watch sent for you to see without one penny down.

THE SANTA FE WATCH CO.
56 Thomas Building. Topeka, Kan.

The Home of the Great Santa Fe Railway

A letter postcard or this coupon will bring My Beautiful Watch Book Free

SANTA FE WATCH CO., 56 Thomas Bldg., Topeka, Kas.

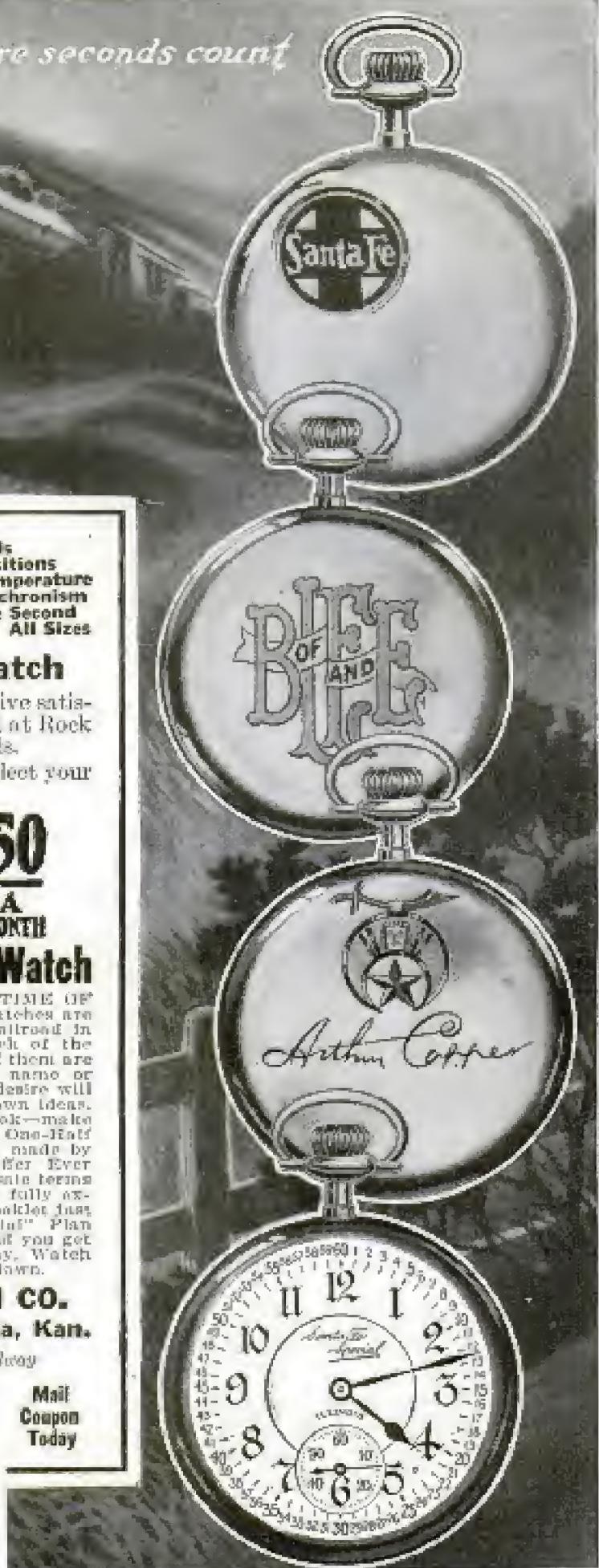
Please send me your New Watch Book with the understanding that this request does not obligate me in any way.

Name.....

Address.....

State.....

Mail
Coupon
Today



YOUR HOME Is Within Your Reach When You Buy From Us

NOW is the time to build
your Harris Home!

And here is a mighty organization of thirty great departments ready to serve you. Managed by expert material buyers, designers and practical builders. We have vast stocks bought at huge quantity price savings which are now at your command. Our sole aim and purpose is

To help you get a home that will prove entirely satisfactory at a price that will mean a substantial saving in actual dollars of your money.

The combined efforts of these great departments in experimenting and testing materials and methods of construction have produced for you a GUARANTEED home, expert machine cut, bundled and marked—the last word in building economy.

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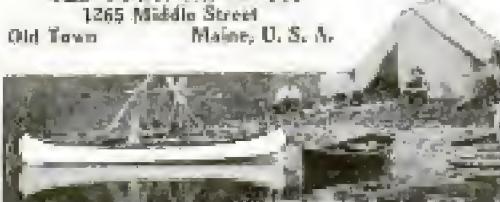
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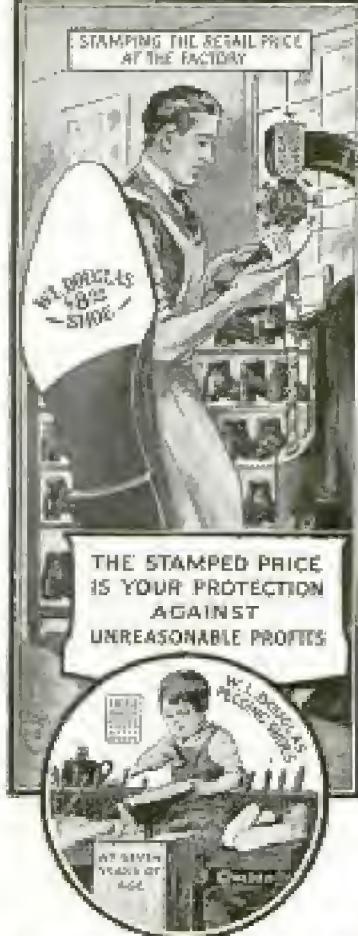
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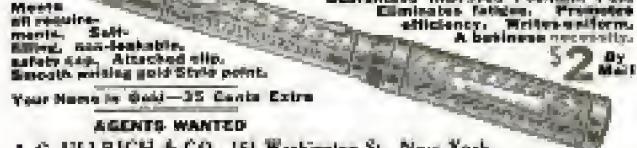
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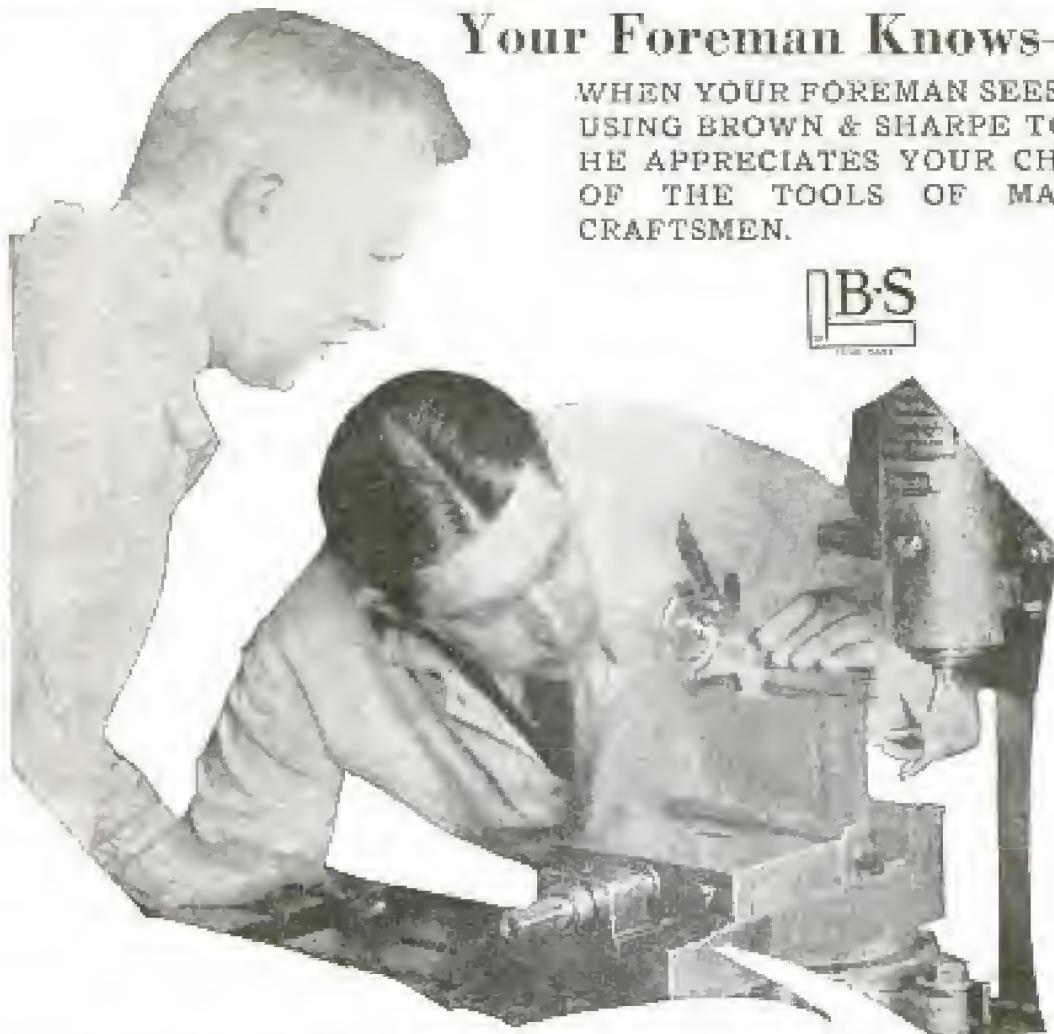
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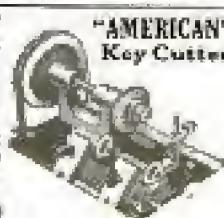


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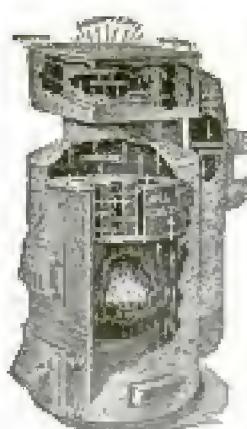
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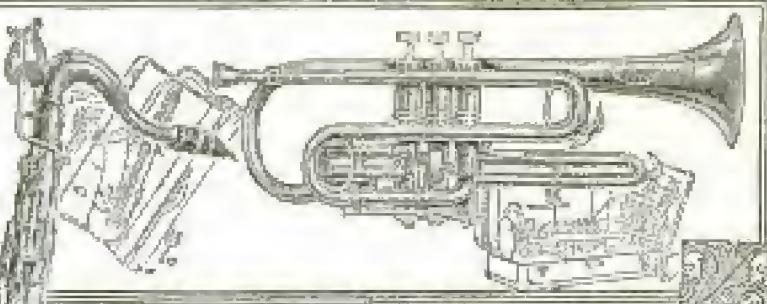
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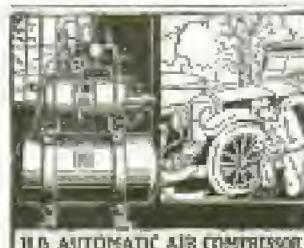
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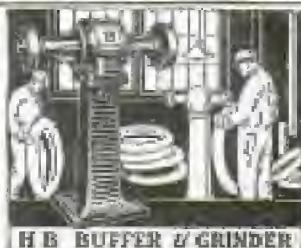
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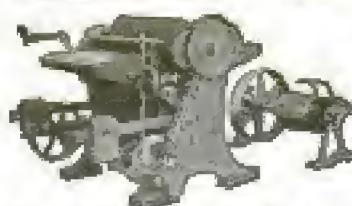


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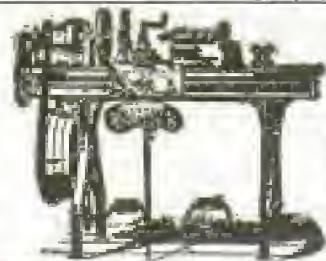
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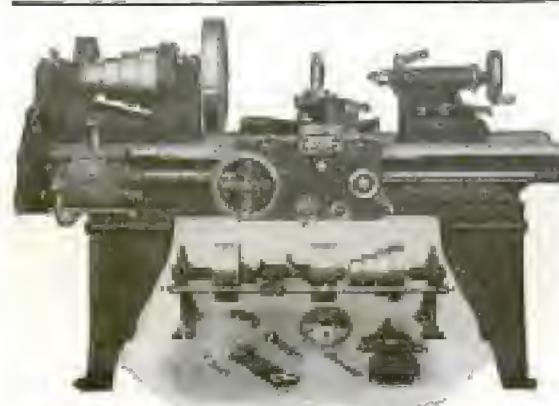
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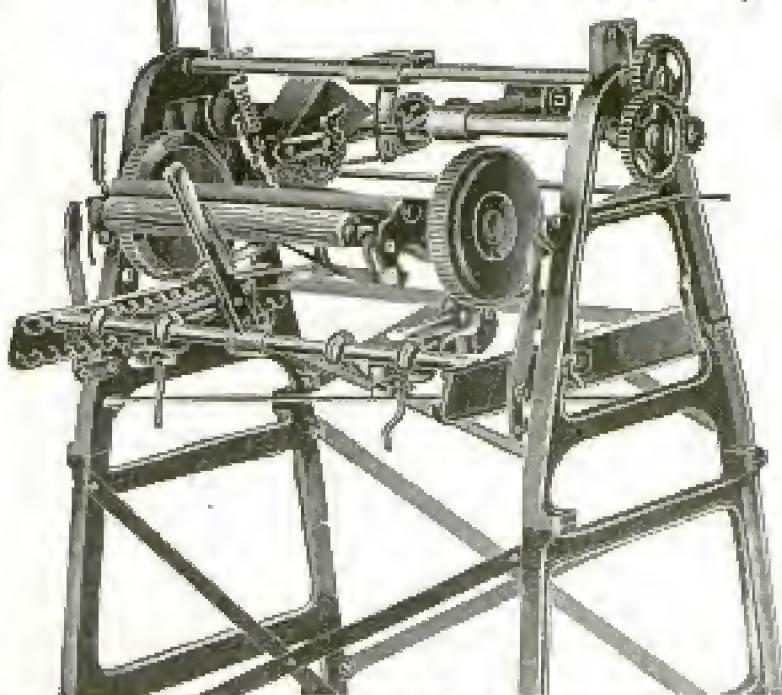
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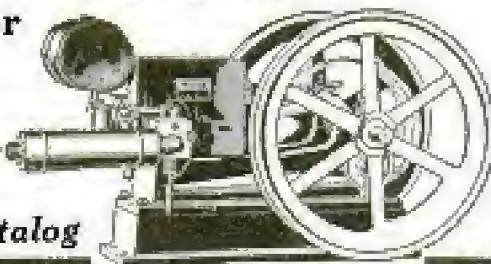
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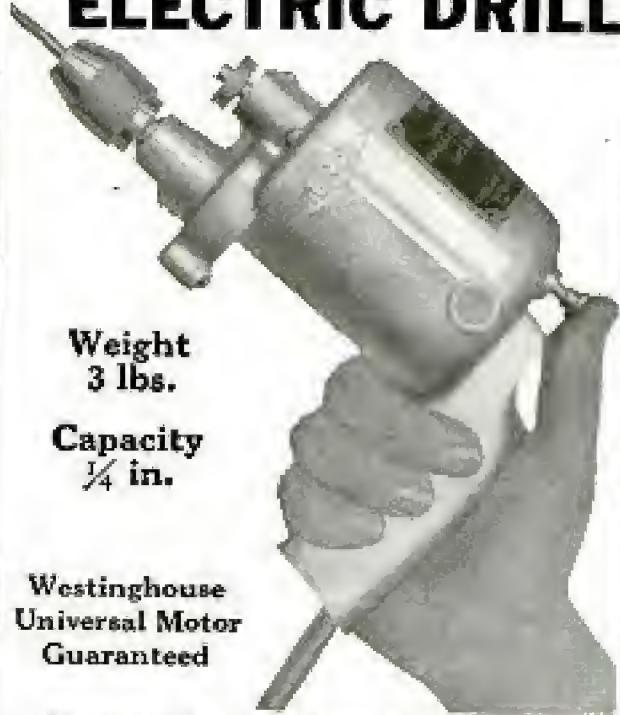
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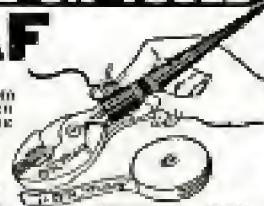
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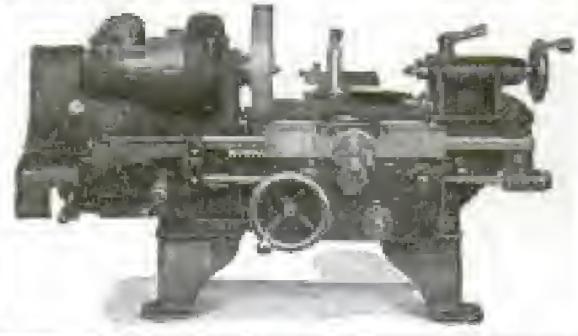
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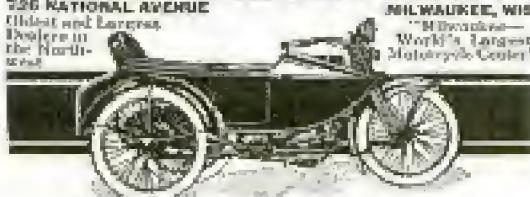
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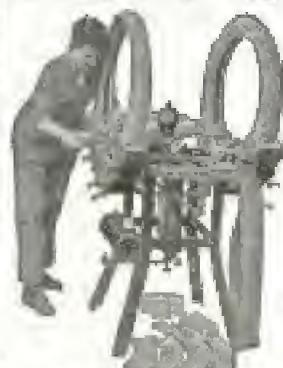
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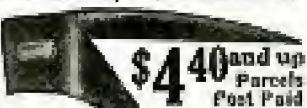
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For 20 days trial on approval. You can have your choice of 44 styles, colors and sizes of the famous RANGER Bicycles. Express delivery. Factory-to-Rider Prices save you \$10 to \$50 on your bicycle.

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No Money, no business dealt with makers.

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RELIABLE STANDARD MAKES that you can DEPEND on. Enjoy the glorious experience of going wherever you like—whenever you like. The price is within your means—25% to 50% less than others. These machines are slightly used, thoroughly overhauled or rebuilt. Best for catalogues.



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Lundberg's wonderful victory over a big field, at Portland, Oregon, where he captured both the Northwest and Oregon State championship scalps, was won with a Dayton—the fastest, sturdiest and most dependable bicycle on the market.

The story of Arthur's success is interesting—it's a story of rider and bicycle leadership.

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"Leaders Since Your Dad Was a Boy"

May we send you (free) a copy of our new art catalog? Most of all we would like to send you (also free and postage paid) a copy of a most interesting booklet entitled: "How to Choose a Bicycle."

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Cycle Division

The Davis Sewing Machine Co., Dayton, O.

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The Davis Sewing Machine Co., Dayton, O.

Please send me, without obligation, your booklet No. 28, "How to Choose a Bicycle" and the 1922 Dayton Catalog.

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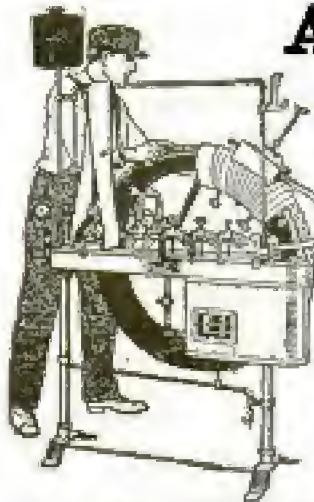
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Don't be content to plod along on a small salary. Be independent. Go in the tire repairing business and make \$60 or more a week. One man made \$45 the first day he received his outfit. Others are making \$25 a day and hundreds of wide-awake men are making \$200 to \$500 a month.

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SHALER-Tire Repair Outfit, \$75

Will do as much and as perfect work as the big \$250 to \$500 vulcanizing outfit. A boy can vulcanize perfectly with this simple machine. It's the only vulcanizer that has Automatic Heat Control. It most vulcanize just right. It can't undercure or overcure a tire. Requires no watching or regulating. You can learn to do expert tire vulcanizing in half an hour with the Shaler.

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EVERY car should be equipped with a Stromberg Gasoline Filter. It cleans the gas—removes all dirt and water—just before it enters carburetor. Eliminates repair bills. Needle valve shuts off flow of gas when sediment chamber is removed for cleaning. Easily attached to vacuum tank, carburetor or gasoline—do it yourself. Well made—outlasts car. Prevents theft—it locks car.

Avoids trouble.

State name and model of your car.
Stromberg Motor Devices Co.,
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This Season's Biggest Money-Maker—HB BATTERY CHARGING

Brings new customers, increases profits. \$20 puts an HB Charger in your shop. Profits quickly pay balance on easy terms. Absolute money-back guarantee. No skill or electrical knowledge required. You can clear big profits every month.

Biggs for 8, 10, 15 or 25 batteries. Sturdy, dependable, nothing to wear out or break. No expensive repairs or costly renewals. Let us recommend outfit to meet your needs.

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GREY GOOSE SHOCK ABSORBERS

Racing, riding absorber of all time. Easily and quickly attached—only 4 bolts to change—requires no special tools. Put a set on your car. Invite other Ford owners to ride with you. Make sales easily at our price of only \$10 for a complete set of 4. (612 in Rocky Mountain States and West.)

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Dept. 195

ADVANCE DOOR LOCKING HANDLES for FORD Closed Cars



Installed quickly by anyone. They fit in place of original handles. Ford owners delighted with them. Left handle locks automatically, right handle locks with key. Fully guaranteed. Agents: Beautiful sample pair furnished with full particulars. \$3.50 U. S. \$4.20 Canada. Check, money order or C. O. D.

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MAKE YOUR FORD INTO THIS SPORT CAR \$6.40



Other types down to \$1.50. Pictures give full details. You can easily convert your Ford into his fast, gay Sport Car in hundreds less done with a few dollars worth of material. From the heads and engine to the rear body. We will supply the parts. We will take up the cost of shipping. Price includes wheel spokers. Printed Motor Sports Manual Ready to be shipped. Built low, rides wonderfully easy. Order now. HDM—We can make good deal. Write, send the name for telephone connection or Box 140, Troy, Ohio.

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640



Champion Regulars now 75¢
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For Every Engine Everywhere

Your Dealer has Champions
and can tell you why
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Make Your Ford Ride like a "Six."



Save the expense of shock absorbers. Enjoy real riding comfort—without the vibrations, shocks, squeaks and jars. Install a set of Q. E. D. Spring Oliers on your Ford Car and ride in ease.

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Oil every leaf of your springs, oil the channel iron of rear spring, prevent rattles, remove any rust that has accumulated, help prevent broken springs, and prevent wear and tear on motor and body.

No holes to drill.

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Installed in 3 minutes.

Easy to install yourself.

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Initial Charging Rate, 6
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Price Complete - \$16.00
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The **Sterling**
Portable Rectifier

Individual battery charging at last practical and inexpensive. The Sterling charges a totally exhausted battery overnight for a few cents. Improved floating rectifier, simple, effective, and durable. One rheostat does all the adjusting. Automatically tapering charge safeguards against overcharging.

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To introduce the best automobile tires in the world. Made under our new and exclusive Internal Hydraulic Expansion Process that eliminates Blow-out—Stone-Bruise—Rim-Cut and enables us to sell our tires under a

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We want an agent in every community to use and introduce these wonderful tires at our astonishingly low prices to all motor car owners. Write for booklet describing this new process and explaining our amazing introductory offer to owner agents.

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SPECIMEN PRICES
Ford-Dart-Chew. \$18.80
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Same 50% saving on all cars

Largest Exclusive Mail Order Battery House in America

Famous "Royal" Batteries—highest quality made—now selling direct from factory to end owner. You save half. We give written 2-year guarantee—longest on any battery. Big responsible corporation backs guarantee. Batteries for any car, tractor or gas engine.

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"REO" Metal Shingles

Absolutely rust-proof—edges as well as shingles. Not the spines of a pin point exposed to weather. Also fire and lightning proof. Reduce insurance on your building. Need no repairs—and all roofing contractors have to buy—one man can do the work—beginner and callowest tools needed. Lay over old shingles if desired. Patent Interlocking Device makes water tight seams—all nail heads covered—no rust or leaks possible.

Exclusive "Tightcoat" Process

Put all Edwards Galvanized Roofing in a class by itself. Bend, twist, stretch it with a hammer as much as you like—you can't break or snap off the interlocking—due to our "TIGHTCOAT" process which practically makes the covering a part of the metal sheet. No other galvanized roofing can withstand this test.

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For **FORD CARS** Any Year, Any Model
Genuine HEINZE-SPRINGFIELD \$49.75
Starting and Lighting System

Limited supply—latest improved type. Price includes Ammeter, Dash and Tail Lights, Switch Lock and our high-grade battery of standard make. Quick, safe start—bright, steady lights. Easily attached to any Ford. Order direct from this ad or write for literature.

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\$45 Buys This Motor Cycle

It's a Harley-Davidson, 16 HP., twin chain driven engine and clutch. It has power and can get up and go on the open road at a speed which thrill. This is only one of hundreds of thousands in used motor cycles which you can get. Send for Free Catalog. It tells of the features and tremendous values in used motor cycles. Requires quick delivery. Motor cycles exchanged. Send us your machine to be evaluated.

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MAKE DRIVING
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Equip your old Ford or Chevrolet Chassis with one of our new distinctive modern bodies. Up-to-date Roadster, Touring and Speedster designs. Ford bodies as low as \$29.50 and up. Territory open for live wire dealers and agents. Make real profits. Buy Direct from Factory.

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"Fishing Tackle that's
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ONE OF 16,400 ITEMS



"Glowbody" Minnow

Crystal body contains tube of permanently luminous material. Looks like wriggling worm as it spirals through water. Attracts bass day or night. Double hook easily detached and single hook substituted if desired. Crystal body protected by wires. Retails at \$1.00.

Ask your dealer for Abbey & Imbrie quality tackle, Catalog—A Fishing Handbook—on receipt of 10c.

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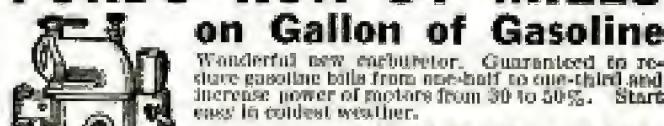
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FORDS RUN 34 MILES

on Gallon of Gasoline



Wonderful new carburetor. Guaranteed to re-share gasoline bills from one-half to one-third and increase power of motors from 30 to 50%. Start easily in coldest weather.

Sent on 30 DAYS' TRIAL

For any car. Attach yourself. Fords make as high as 34 miles to gallon. Other cars show proportionate saving. Send model of car and take advantage of our special 30-day trial offer. Agents Wanted.

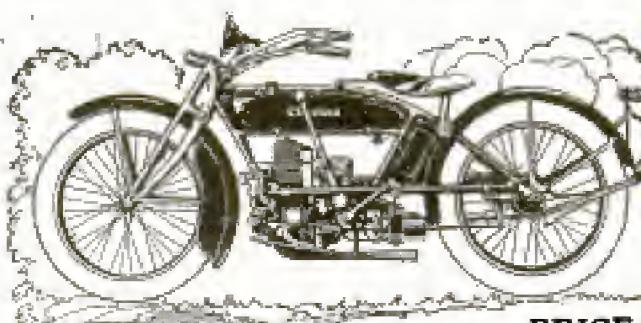
AIR FRICTION CARBURETOR CO.

3330 Madison Street

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Tires With 500 Nail Holes Leak No Air

A new puncture-proof inner tube which in actual use was punctured 500 times without showing the loss of any air when tested by a tire gauge has been invented by Paul B. Costs, an electrical engineer of Chicago. It is inflated with air and has the same appearance as the regular inner tube, yet it removes all the necessity of changing tires until the casings are entirely worn out. Cars using these tubes are making from 8,000 to 12,000 miles without removing a tire from the wheel. A wonderful feature of this new tube is that it can be produced and sold at about the same price as the ordinary tube. Mr. Costs has turned over all his rights on his invention to the Milburn Tube Co., 425 W. 47th St., Chicago, who wants to place these tubes in a few cars in every community. They will make a very liberal offer to any one who wishes to try them at the company's risk, until a distributor is appointed for the territory.



PRICE
\$185

Lowest Price— Lowest Upkeep

of all real motorcycles. Cleveland's \$185 price is half the average motorcycle price. Cleveland travels 75 miles to the gallon of gas—15,000 miles on a set of tires.

America's super steel, Mo-lyb-den-um, gives the Cleveland remarkable sturdiness and durability with light weight.

Low saddle, low center of gravity and light weight make the Cleveland as safe as a bicycle. The Cleveland will give you all the pleasure, comfort and dependability of the big machine at half its cost.

Write now for catalog "M." If there is no Cleveland dealer in your city can you recommend a "live" man to represent us?

CLEVELAND MOTORCYCLE MFG. CO. 7th
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MOTOR CYCLE **Cleveland**

CAR OWNERS Wanted!

To use and introduce the world's finest, wonderful new process, automobile tires. Massively oversize! Astonishing guarantee! Best wholesale prices to one agent in each community.

INTERNATIONAL TIRES PIRON (No-Rip) TUBES

WRITE for our amazing introductory offer to owner agents

Dept. 109 INTERNATIONAL RUBBER CORPORATION, Grand Rapids, Mich.



DIAMONDS ONE CARAT \$195⁰⁰

Former retail cash price \$225.

New low prices 40% discount. 1/2 carat \$148.25; 3/4 carat \$197.50; 1 carat \$248.75. If installed, pay 20% down; balance in 10 months, 1% payment.

10 MONTHS TO PAY
Genuine sparkling blue-white diamonds now sold direct to you by DIAMOND IMPORTERS on credit at 40% discount. 14 Kt. solid gold ring included free. We guarantee to satisfy you or return your money. 30 DAYS FREE TRIAL! Order direct from advt., or write for 128-page bargain catalog, sent free.

31,000,000 and 42 years' experience are back of our guarantees.
B. GUTTER & SONS 172 MASSAU STREET
Div. 207, NEW YORK



Jimmy's Diary Monday, May 8th—"After school hopped on bike and went fishin'. Comin' home had a puncture. B-a-s-a-a-a-a went and stopped. Gee, I was lucky. It was in the tire. I had put Neverleak Tire Fluid in three weeks before. Didn't lose any air because Neverleak stopped the leak." A 26c tube of Neverleak saves expensive repairs and makes tires last longer. At all bicycle and repair shops.

FREE—Send for handy Neverleak Pencil Clip. In attractive colors, holds pencil firmly in place.

BUFFALO SPECIALTY CO.
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NEVERLEAK TIRE FLUID "HEALS PUNCTURES ON THE RUN!"

MOTORCYCLES
ONE YEAR TO PAY

Know the joy of owning—for business or pleasure—a HARLEY-DAVIDSON, EXCELSIOR, HENDERSON, INDIAN, CLEVELAND, or any other standard make; thoroughly rebuilt in our own factory. Write for Free Bargain Bulletin and Easy Payment Plan.

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America's Largest Cycle House
Established 26 years
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and Make Big Money During your spare time—something different, better, bigger, more liberal than any offer ever made. Lower prices—better clothes—bigger cash profits—expenses or postage paid on everything.

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Fifty-six styles, real cloth samples—FREE colored fashion plates; Inside wholesale prices—everything FREE. Just drop in a line today and we will send complete outfit FREE.

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E-245, Chicago



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SAVE YOU 50%
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and You Get
an Unconditional

WRITTEN TWO-YEAR GUARANTEE

6 VOLT 11 PLATE

for Cleveland, Elgin, Ford,
Hedgehog-Brether, Grant, Dury,
Nash, Hugineville, etc.
Usual Cost \$32.00. **\$13.00**
Our Price.

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Studebaker, Maxwell, Cole,
Chevrolet, Mitchell, Hupmobile,
Hudson, Paige, etc. Usual
Cost \$40.00. **\$15.00**

Shipped fully charged ready for installation

Begin now to get 100% battery service at half cost, by
sending us your order today.

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for Dodge, Maxwell, Crouse-
Ellis, Regal, Franklin, Bris-
ton, etc. Usual Price
\$52.00. **\$20.00**

GLOBE STORAGE BATTERIES FOR WIRE-LESS USE

Volt. Amps.	Price	Volt. Amps.	Price
6 30	\$7.00	6 40	\$8.00
6 40	8.00	6 50	10.00

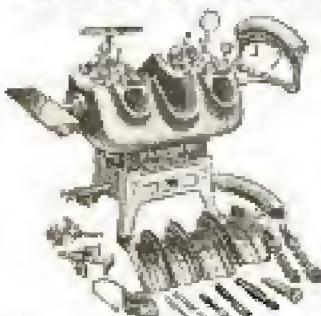
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EARN \$150.00 A WEEK BY YOURSELF with a DUNCAN VULCANIZING PLANT



Includes every tool and vulcanizer for a high-grade repair business. Will handle the work of six men.

We start you in business for as low as \$125.00, balance easy monthly payments, and teach you approved factory methods of the repair, at home or in one of our own repair shops. FEE: We also pay you \$5.00 to \$6.00 per day for the last eight to ten days, when you take the course in one of our repair shop schools, in connection with the purchase of a No. 10 or No. 11 equipment.

Can you hear this big chance to earn your own business upon an small capital?

The Duncan will cure two or three times as many tires a day as any other would. It is the only mold made that will compete with and beat equally as well as with air bag.

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New Gum Vending Machine Makes You \$10 to \$20 a Day

Pays Rent for Store Owner

Install one in your store or any public place and get this easy profit. Requires no attention. Always works. Machine pays rent. Write us about rebuilt penny and nickel machines. Finished like new. In excellent running order. Pay their cost in 10 days.

Write or wire today for full particulars. \$35 down payment. Balance C. O. D. Minst \$50 per case - 2,000 pieces per package. Single boxes, 100 5 cent packages, \$2.50.

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419 Williams Bldg. Indianapolis, Ind.



AUTO DRIVERS

Can make big money in spare time or devote entire time to introducing and taking orders for our

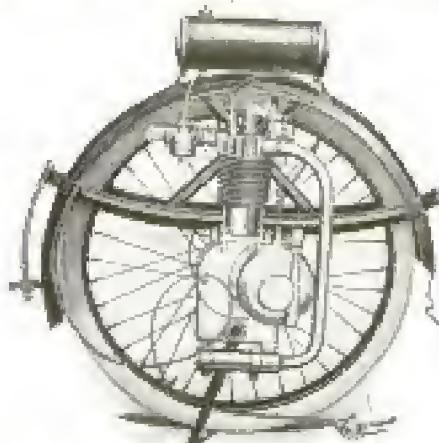
IMPROVED CORD TIRES

Highest quality. Sensational prices. Big profits. Permanent business. Write today for catalog and agent's special offer.

LANGAN & PHILLIPS
Dept. 104 CHICAGO



HERE IT IS



THE MERKEL MOTOR WHEEL

A self-contained power unit to convert the bicycle into a motor driven machine, can be fitted in place of the rear wheel of any standard bicycle.



The final answer to the transportation question.

No skill or special tools required to install it.

It is equipped with a clutch, thus permitting motor to run when you stop your bicycle in heavy traffic.

All working parts automatically oiled.

The Merkel Motor Wheel is not a TOY or Make-shift. IT'S A PRACTICAL POWER PLANT. Designed to meet the long felt desire of the Bicycle rider.

POWER—Enough to master all hills on the highways.

SPEED—Sufficient for safe riding.

Simplicity of operation, any Lady or Gentleman, Girl or Boy owning a Bicycle can operate it.

ECONOMY—No other Motor vehicle in the World can be operated so cheaply as the Merkel Motor Wheel. FUTURE MILES for ONE CENT.

SATISFACTION—More than you have had with your bicycle, because it will speedily take you there and back without exertion on your part.

Price \$85, F.O.B. Springfield, Mass.

Send for Merkel Catalogue

If there is not a dealer in your town selling Merkel Motor Wheels, write to—We want agents everywhere.

HENDEE MANUFACTURING CO.
MERKEL MOTOR WHEEL DEPT.
SPRINGFIELD, MASS., U. S. A.

only \$1

Puts this Genuine Diamond CLUSTER RING ON YOUR FINGER

There is no red tape about this phenomenal offer. And we are positive you will be entirely satisfied with this wonderful gem. It's a .43 carat with this beautiful ring on your finger. It has seven perfect cut genuine diamonds.

Looks like 1½ carat

Compare this gem with a 1 1/2 carat diamond and you will see that it resembles 1000 solitaires. The perfectly cut, sparkling, brilliant stones are set in solid platinum not just Platinum-Too which gives it added beauty. Send us a dollar bill with your name and address and we will ship this wonderful bargain to you or return mail.

Wear it 30 DAYS FREE

If not satisfied after 30 days, return and we will refund your money. Never to be beaten in price or quality. Made on our best terms of \$1 per week or \$4 per month until \$25.00 is paid. That is but 1/10th the cost of a \$250. You will agree we offer a real bargain. This is one of many bargains illustrated in our Free catalog. Mail your order today to Berg, 2-88.

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Guarantee
You must be absolutely satisfied or money back.

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Are You 100%?

Are you fit—vibrant with health and energy—smooth-skinned and clear eyed?

If not, you should investigate RenuLife Violet Ray.

By eliminating the ill of the body and building up new strength and vitality it leaves you as good as new with clear skin, glowing cheeks and a properly functioning body.

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HEAVY SOLID COPPER

4 GAL.	4.95
6 GAL.	6.50
8 GAL.	7.75
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Copper Oil Kettles

All made of 16, 18, 20 and 22 gauge beat cold rolled heavy solid copper. Non-explosive. All solder outside. 5 inch air-tight screw cap. Absolutely guaranteed to be the best and strongest kettle made.

Cheers shipped the day order is received. Packed in strong plain boxes. Above are lowest factory cash prices. Send money order or draft with order.

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Transfers black and colored pictures and designs from newspapers, comics, etc. to paper, silk and linen handkerchiefs, plates, chinaware, etc.

USEFUL AND AMUSING
Complete set with 25c
Directions—Send 25c
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This unique Razor-blade pocket knife is the handiest, safest general utility knife. Uses an old Gillette blade. Artists, writers, draftsmen, tailors, dressmakers, office men, women, school children all need RAZO. Send 25c for yours today. Great money maker for agents.

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LAKWOOD FAN BELT FASTENERS

MAKE or repair your own flat belts for Autos, Tracks, Tractors, Electric Washers and small shop Machinery with Lakewood Quick attachable Fasteners. Two sizes— $\frac{1}{8}$ in. and $\frac{1}{4}$ in.; used alone and in combinations handle eight widths flat belting. Simply square up ends, rivet half of fastener to each end, slot together and go. Belt can be removed from pulleys instantly, but can't open in driving. Complete Fastener with rivets, 15c per set; $\frac{1}{8}$ for 1 set; $\frac{1}{4}$ for 6 sets; or 12 sets in neat slide box for \$1.00. Specify size wanted. Sent postpaid same day order received. Fine proposition for Garage, Repairmen, and Dealers.

Also for V-Type Belts
LAKWOOD FABRIC BELTING & MFG. CO.
1518 W. 117th St., Lakewood, Ohio

**1/4 H.P.
110 Volt**

\$13.50



AN AMAZING VALUE

Study the specifications of this Motor—Make comparisons—You will not find its equal at anything near our price

It is built for long service. The size, $9\frac{1}{2} \times 2\frac{1}{2} \times 3\frac{1}{2}$ and the weight, 23 lbs., show it isn't in the cheap bargain class. It's a Wagner motor, fully guaranteed. H. P. M., 1725; 60 cycle—1 phase. Has pulley, cord and plug. Shipping weight, 35 lbs.

A real motor—runs your drill press, small lathe, welding or other household machinery; radio equipment, milking machine, sewing, etc.

\$13.50 Send cash with order or we will ship C. O. D. if you prefer

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Wholesalers of everything electrical

Make Full Time Money

Selling a 100% Auto Necessity—
Not Just a Rich Man's Accessory

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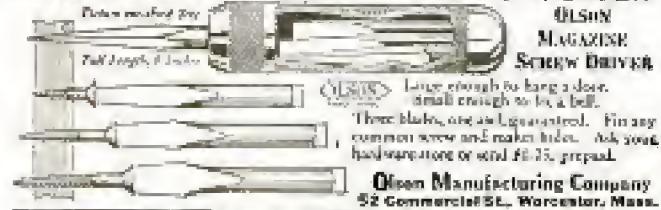
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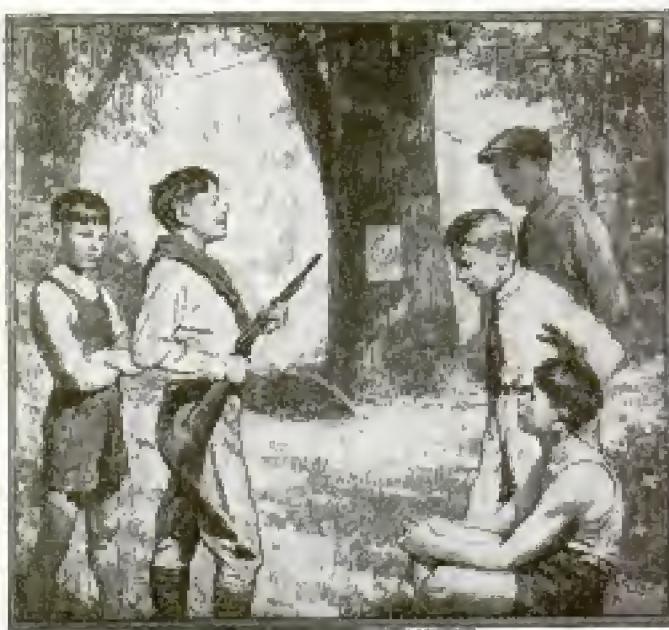
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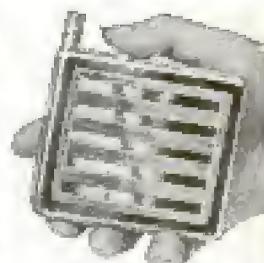
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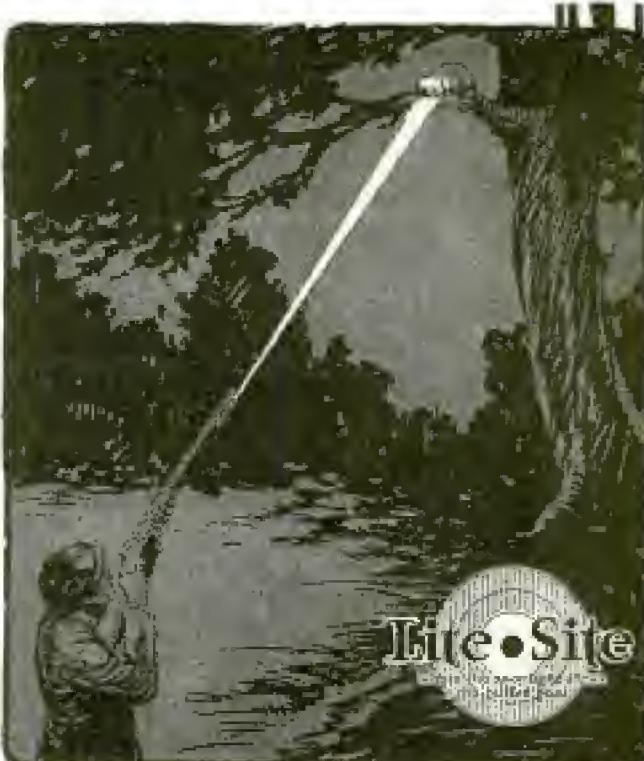
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Bureau of Inventive Science, 45 Wiener Bldg., Rochester, N. Y.

The MILLER LUGGAGE CARRIER **\$600**
"Most practical Carrier ever built"

Gives a Ford Car a Higher Priced Appearance
 No fuses or wires to apply—Work can be done in a few minutes

Practical, compact.
 Serves as all-season running board when closed.

Only carrier on the market for a dollar of a Ford carrying maximum price and quality.

Extends 9 inches above running board of car.

Showing Miller Luggage Carrier applied to Ford Sedan and closed for service running board.

Showing Miller Luggage Carrier open attached to Ford running board and secured.

The MILLER Luggage Carrier is built the correct size for use on any model Ford. It is easy to apply and once on it stays put for a long period of service. Farmers, mechanics, salesmen, tourists, in fact every one carrying loose packages, can free their feet and arms from luggage formerly jammed inside the car by using a MILLER Luggage Carrier for Ford cars.

Here is a Luggage Carrier for Ford cars with these new points not found in any previous model: suspended carrier board by taking up vibration and adding to stability of carrier; carrier the largest and easiest package; provides an attractive running board when folded up, with a Battleship Chrome surface and a soft aluminum lead around the edges.

Simple and strong in construction—extremely light. Delivered ready to put on, with complete hardware, tools and wrenches. Does not break down the edge of the running board. Can be taken off, fast. **PERMIT THE DOOR TO SWING OPEN FREELY.**

Price \$6.00. The profit for dealers, especially Ford dealers will be substantial since friends.

THE MILLER CO., Fulton and Lincoln Sts., Chicago, Ill.

Electric Motors below cost \$10

"1-1/2 H.P. motor received and must say this motor is a wonder."

Joe E. Sironi, Carbondale, Pa.

"Motor received. Much pleased with it. Please ship one more 40 cycle without pulley C. O. D. express."

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THESE ARE WONDERFUL MOTORS

Strictly first grade in all respects, bear our name plate and fully guaranteed. New motor or free repair if anything goes wrong within one year.

Never Again Prices to Equal This

Several large contracts were cancelled after the motor parts were all made. To turn them into cash we are advertising them below cost. Act now. Choice of a 1/2-H.P. Sett cost or order C. O. D. by express.

Net weight 20 pounds. Shipping weight, 20 pounds. Easy means of reversing direction of rotation. 10 ft. cord with 2-piece attachment plug 65¢. Pulleys 1 1/2 inch or 2 inch, 50¢.

Don't lose out on this chance. Money back quick if you are not more than satisfied.

REYNOLDS ELECTRIC CO. 2610 W. Congress
 Chicago, Ill.



A WORLD WAR SOUVENIR for a dollar

THESE finely made, full floating dial compasses, used by the American Expeditionary Forces, are being offered by the War Department at \$1 each as long as they last. All compasses new.

The floating dial, graduated every 5°, has jeweled bearing. North, South, East and West points glow at night. At once, a beautiful pocket compass and a practical surveying instrument.

Or for 50 cents

You can get a floating dial watch compass in beautiful open face brass case. Luminous needle and compass points. All compasses are new.

Buy from Uncle Sam

Send cash or money order, stating number and style of instruments wanted, to

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WAR DEPARTMENT

Only \$45.00 For This Job Complete
 Sets established freight rates and
 one-half original cost by buying
 Ford Speedster Bodies
 knock-down. Simple,
 complete. Instructions
 furnished, all parts easy
 to assemble. Any one
 can assemble this job.
 Complete with hood, radiator
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 system, metal parts, wood parts,
 belts, screws, etc. This radiator shall furnish made up. Designed low
 with lack of wind resistance. Price set \$45.00. Further information on request.
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Not Painted Materials
 All Parts Complete
 Design Low
 with Lack of Wind Resistance. Price set \$45.00. Further Information on Request.

Used Motorcycles
\$40⁰⁰ and up
Bulletin FREE
ASH MOTOR CORPORATION ROCHESTER, N.Y.

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NO LAY OFFS—PAY YOU DAILY

Special Representatives wanted in every State taking orders for Aluminum Handle Cutlery Set.



Written guarantee with each set. Big demand. All you do is take orders. We deliver and collect—pay you daily. Brand new set. Handles made of pure aluminum. Will not hold heat. Can't come apart. Write at once for proposition to County Representatives. No experience or capital needed.

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\$2 Brings A Genuine DIAMOND RING \$2 for 10 Days FREE TRIAL

Set in
Plati-
num

Resembles
\$350.00
Solitaire

Ladies' Gentle Diamond Ring
Seven brilliant steel-blue genuine diamonds mounted by a expert jeweler in a setting of solid platinum set so closely together that only close inspection will distinguish it from a solitaire valued at \$350.00. Shank of ring 14 karat gold. Price only \$48.00

Set in
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Resembles
\$350.00
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14 K.

Most Sensational Ring Offer Ever Made No Red Tape No Delay

Send only \$2.00 and your choice goes to you in a handsome gift box, charges paid. A legal guarantee bond as to quality and value accompanies each ring. After ten-day trial pay balance \$4.65 a month for ten months.

Ten Days' Free Trial

You take no chance—if it is not satisfactory at the end of ten days, or if you can duplicate either of these genuine diamond rings in any jewelry store for less than \$65.00, your deposit will be refunded to you.

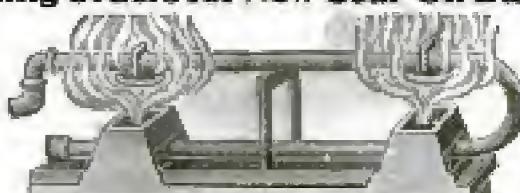
Free Royal Bargain Bulletin

Illustrates and describes over 800 special offers in Diamonds, Watches and Jewelry which we are making this month from our \$2,000,000 stock. Address Dept. 537

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ESTABLISHED 1888
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Gentleman's Gentle Diamond Ring. Seven brilliant steel-blue genuine diamonds mounted by a expert jeweler in a setting of solid platinum set so closely together that only close inspection will distinguish them from a solitaire valued at \$350.00. Shank of ring is 14 karat solid gold. Price only \$55.00

AGENTS: \$54 a Week Taking Orders for New Coal-Oil Burner



Most perfect burner ever invented. Can't sing up. Burns just like gas. By regulating valve you get as little heat as you want, or you can heat oven to baking point in ten minutes.

BIG SUMMER SELLER Burns coal-oil. One hour for two cents. Low-priced. Nothing else like it. Not sold in stores. Write now for money and sample. No payment or capital needed. You take the orders. We do all the work, and do all collecting. Commission paid same day you take orders. PARKER BURNER CO., 778 Coal St., Dayton, Ohio

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BIG PROFITS. We furnish guaranteed high grade breeding stock and pay you \$7 to \$10.00 upward per year and expression for all you raise.

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Gratz Made \$394 a Week

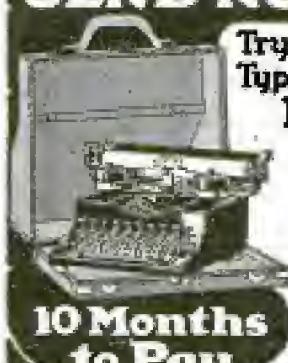
JOST earned over \$7285 in 6 months. We paid TED GNAU \$4455 for five months work. Easy to take orders on account of low price. \$8 a day for spare time. Big opportunity for the right men.

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Try this Portable
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84 characters. Brand new—not a rebuilt typewriter. Neat, compact carrying case free with every machine. Rent today for our 10 Days' Free Trial offer and 10 Months' Easy Payment Plan.

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50%

SPECIAL BETHLEHEM SPARK PLUGS

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HERE'S a chance for you to purchase Special Bethlehem Spark Plugs at less than jobbers' prices.

Genuine "775" core. Two-piece construction. Porcelain guaranteed not to break with heat. Supplied with $\frac{1}{8}$ -inch threads—with $\frac{1}{8}$ inch or metric. Latest style snap clip screw top. Made throughout of the best material obtainable.

Our Prices

12	@	40c each
25	@	35c each
50	@	30c each
100	@	25c each

Packed in individual boxes.
Usual retail price \$1.00

Terms

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Car owner agent wanted in every community, to use, introduce and take orders during spare or full time for Harrison Hand-Made Tires at our low prices. Fully GUARANTEED 30,000 MILES (not seconds) finest materials used. Shipped on approval prepaid. Capital or experience unnecessary. Sample sections free. Write for local agency offer and get exclusive factory prices to your agents.

HARRISON TIRE & RUBBER CO.
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Agent Wanted

Men With Autos Wanted



to introduce and take orders for our NEW PROCESS STORAGE BATTERY. Plates cannot sulphate or buckle. No expert attention required.

One-half cup water every 3 months. Made for autos, radios, lighting outfits and all other battery purposes.

Guaranteed 2 Years

The biggest money maker and greatest business builder ever known. Write today for our exclusive proposition and low wholesale prices.

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Big Money For

FORD OWNERS

Stir your Ford with one hand at thirty miles an hour over rough roads. Shoot through sand, mud, gravel, in and out of ruts and over car tracks. Your front wheels CAN'T turn and ditch you. Your Ford will stick to the middle of the road like a Packard or a Cadillac if it is equipped with

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SAFETY SPINDLES

Give another driver just five minutes behind your wheel after you put them on your car. You've made a sale. No talking necessary—they sell themselves. Liberal profit on every sale. All or part time.

Get Exclusive Contract For Your County

Hundreds of Ford owners within a few miles of you. Most of them will buy after a five minute trial. Make big money wherever you drive your car with these and other fast selling accessories of our manufacturer. WRITE US TODAY.

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Make sure your home or buildings aren't next to be robbed. Thousands of dollars and precious valuables lost yearly because most locks are worthless and offer no protection. Test your locks with this wonderful set of Master Keys—5 keys in all, and each one different. Have proved their power to open thousands of different locks and showed hundreds that their homes and property really weren't protected. Endorsed and used by real estate men, bankers, firemen, detectives, policemen, hotel owners, etc. Novel key chain FREE! Send only \$1 today. Money back if not satisfied.

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AGENTS SALES MEN

Now is the time to start in business for yourself. Make \$10 to \$15 daily.

Automobile owners want initials on their cars. You apply them while waiting, charging 25c per letter; three letters on each side of the car, six initial letters in all, for which you charge \$1.50, and you make \$1.25 profit. They could not get finer work if they paid \$5.00; then again, no sign painter could give them as nice a job as you could do without experience in 15 minutes. You can sell to individual auto owners, or you can sell to garages and supply stores complete display outfits, like the one illustrated, at big profits.

250 popular monogram letters in two of our most popular styles, with eight borders to match and complete working outfit only \$5.00. Send money order or certified check. Outfit sent C. O. D., upon receipt of \$1.25 deposit.

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A Torch with Hundreds of Profitable Uses

Torit Acetylene Torch No. 13 PRODUCES A HOT INSTANT FLAME

For radiator and battery repairing; for soldering electrical connections, pins, pins, etc.; for preheating founders, tempering tools, joining brass tubing, removing rusty bolts and nuts; for light brazing and hundreds of other uses.

A Practical Outfit for Every Mechanic *User Acetylene Gas Only*

Complete with 4 different tips and soldering \$7.50 copper, rubber tubing and tank connection.

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MOTORCYCLE

Economical
Practical
One Man
Transportation
Complete with
Two-Speed Gear
Clutch
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WRITE for CIRCULAR—Meetion occupation when writing.
SCHICKEL MOTOR CO., 6907 Garden St., STAMFORD, CONN.

\$50 a Week EASY

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Write today for proposition.

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The NON-SKID Ink Stand

"Stay put!"



Cannot move, slide or stray from where you place it. A cork layer at bottom does the trick. Made of iron. Will hold any regular size desk ink bottle. Looks attractive. Heavy enough to be used as a paper weight. Mailed day your order is received.

NOTESCH & CO., Sole Mfrs.
1400 Broadway, New York Postpaid

35¢

The Dying Pig



The pig on his feet, when he begins to stagger as he slowly collapses and finally lies down and dies is the most natural chapter. You can blow him up as often as desired, and each time he will go through the entire performance to the great amusement and delight of your friends.

Price 15 cents; 3 for 40 cents; one dozen \$1.25, mailed postage.

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Popular Watch Charms



Very nicely carved and solidly made. Fitted with Magnalock Latches that release the picture to a very surprising degree in fact, it seems almost incredible that a clear picture could be possible inside a small compass, and how sharp and distinct they show up when you look through. Comes in several sizes—Addresses: 111½ W. Madison, Chicago, Illinoian Trust Co., 1700, etc.

Price 15c; 3 for 40c; \$1.25 doz.

This Man Is Sure of His Job



HE saw the handwriting on the wall. Men in his department were being dropped right and left. He might have been the next to go but for a familiar coupon which he saw one day in a magazine. He marked it, and mailed it to Scranton.

Then one day his employer called him in.

"Young man," he said, "I have just received a letter from the International Correspondence Schools telling me you have enrolled and have received a mark of 93 for your first lesson."

"I don't mind saying that this letter has saved your job. I had you on the list of men to be dropped. But I'm going to keep you now. The man who thinks enough of his future to study his job is the kind of a man we want around here."

HOW about you? Are you sitting on the anxious bench wondering if you will be the next to go? Or are you training yourself so that you will not only be sure of your present job but will be ready for the job ahead?

No matter where you live, the I. C. S. will come to you. No matter how limited your previous education, the simply-written, wonderfully-illustrated I. C. S. textbooks make it easy to learn. No matter what career you may choose, some one of the 300 I. C. S. Courses will surely suit your needs.

This is all we ask! Without cost or obligation, put it up to us to prove how we can help you. Just mark and mail this coupon. Today is best.

INTERNATIONAL CORRESPONDENCE SCHOOLS BOX 5638-C SCRANTON, PA.

Without cost or obligation please explain how I can qualify for the position, or in the subject before which I have marked an X:

- ELECTRIC ENGINEER
- Electric Lighting & Railways
- Electric Wiring
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- Telephone Work
- MECHANICAL ENGINEER
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- Toolmaker
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- CIVIL ENGINEER
- Surveying and Mapping
- MINE FOREMAN or ENGR.
- STATIONARY ENGINEER
- Marine Engineer
- ARCHITECT
- Contractor and Builder
- Architectural Draughtsman
- Concrete Builder
- Structural Engineer
- PLUMBING & HEATING
- Sheet Metal Worker
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- CHEMIST
- Pharmacy

Name 1-14-22
Street
and No.

City State

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Quebec.

Where No Car Could Follow

FAR from the monotony of the crowded city—away from the automobile-infested, dusty main-roads—out where the air is cleaner, the grass greener and the picnic places more inviting—why, man, there's a new world waiting to be explored by you, your pal and a Harley-Davidson!

The best vacations, the happiest week-ends, the most successful fishing and hunting trips—all these are yours when you have a motorcycle. And, to all the pleasures and thrills of the "greatest sport in the world," the Harley-Davidson adds economy. Fifty miles for a dollar—gas, oil, tires and all—that's all it costs. Think of the fun you can have with a Harley-Davidson at so small a cost this summer!

Your local dealer will give you a free demonstration of the Harley-Davidson. Also the reduced prices and an easy payment plan. Or write us for illustrated literature.

Attractive dealer proposition for un-assigned territories. Address Desk A-2.

HARLEY-DAVIDSON MOTOR CO.
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World's Champion Motorcycle



ANY BOY CAN BUILD THIS 20" CAT BOAT

with our complete
Construction Set.

"Everything but
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\$5.00

We have other boats, en-
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MEN WANTED



To call on garages, stores, factories, schools, hotels, homes, auto owners and demonstrate and take orders for now

Super Fyr-Fyter

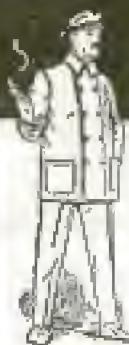
Approved by Underwriters, makes a spectacular demonstration. Burns easily, blank ends \$50.00 first week. DelPrix has averaged \$7000 per year for last 3 years. We can train you, without cost, so you can do as well or better. No experience necessary. Write at once for free details showing how you can earn \$2000 to \$10,000 a year.

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BRINGS
THE

Nogar
SUIT



Here is the kind of suit you have always wanted—a suit that will withstand the hardest kind of wear in factory or shop and in which you can go right out from work looking neat and presentable. A "dry-as-dust" suit that defies wear and water. Perfectly designed for wear on teams and trucks,

Excellent for hunting, fishing, motoring, etc. For all hard work or outdoor sport you need a Nogar suit made of special Nogar cloth that wears like leather. Nine roomy pockets, seams that cannot rip, convertible collar. Send only \$1.00 with order. Pay postman \$1.50 when he delivers your suit (or \$8.75 if you want the patented legging trousers). You take no chances, money refunded if unsatisfied.

NOGAR CLOTHING MFG. CO., READING, PENNA.

\$9.50

Client measurement over vest	in.
Length of sleeve under arm	in.
Pants waist measure	in.
Length of pants	in.
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Coat: Single or double breasted	in.
Weight	height
Name	
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True-Tone SAXOPHONE

Easiest of all wind instruments to play and one of the most beautiful. You can learn the scale in an hour's practice and play popular music in a few weeks. You can take your place in a band within 90 days, if you so desire. Unrivalled for home entertainment, church, lodge or school.

(34) In big demand for orchestra, dance music. The portrait above is of Donald Clark, Soloist with the famous Paul Whiteman's Orchestra.

Free Trial You may order any Buescher Instrument without paying one cent in advance, and try it six days in your own home, without obligation. If perfectly satisfied, pay for it on easy payments to suit your convenience. Mention the instrument interested in and a complete catalog will be mailed free.

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It contains photographs, floor plans and descriptions of 160 homes—colonial or modified colonial designs, bungalows and semi-bungalows, Swiss chalets, Old English half-timbered designs, two family houses, summer cottages, etc. Answers every point you want to know about the Lewis Method of Home Building. 160 pages, 7½x11 inches, fine paper, beautifully bound. Mailed for 25 cents (coin or stamps). Lewis Manufacturing Company, 1254 Michigan Ave., Bay City, Michigan.

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Write name and address plainly. (Note:—If you live anywhere outside of the United States, send \$1.50.)

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NOW
\$64.85

Was \$105

By direct-from-factory selling and eliminating all waste we have cut the price to \$64.85, actually less than wholesale! Don't wait—order from this ad. C. O. D. with privilege of inspection.

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Saxophone players are in demand all the time and get big money! Here's the easiest way to add to your income.

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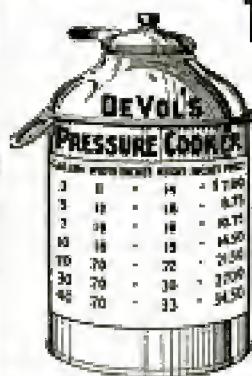
All doors are open to the fellow or girl who can play the Saxophone. You don't know what a good time is until you can play. And the C Melody will be your choice because it's the Saxophone for solos and every other kind of playing.

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DEVOL & CO.

26 Barker Block
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For Graduations, Anniversaries, etc.

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Is Your Brain Hitting on all Six?

All the gas in the world, in the best motor ever made, won't turn a wheel till a spark bursts it into power. Your brain is your motor. Facts about things are the gas. Every boy needs the spark of inspiration to fire his imagination so he will put his facts to work and force himself ahead in the world.

The cracking good stories found every month in

THE AMERICAN BOY

"The Biggest, Brightest, Best Magazine for Boys in All the World"

are a continual chain of sparks that make boys' brains hit on all six all the time. They tell in a mighty human, mighty real and intensely interesting way how men and boys in the work-world use the facts in their heads to get ahead. They show how and why other fellows fail—fellows who had facts, too, but no spark.

What if you had to get gasoline through a forest fire to a stranded airplane? Could you do it? Read "Packing the Gas" in the May AMERICAN BOY, by John Fleming Wilson, and see how three clever kids turned that trick.

That's only a sample. Every issue of THE AMERICAN BOY is full of stories of real life that show boys how to think, think hard for themselves.

Buy the May issue and read the article on Radio, by Armstrong Perry. Straight stuff—and fascinating.

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American Boy

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and Floor
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A composition material easily applied in plastic form over practically any kind of floor. Last about 1/2 inch thick. Imperial floor does not crack, peel or come loose from foundation. A non-slip, non-skid, smooth, non-shifting surface. No crevices to gather grease, dirt, dust, disease germs or moisture.

Ideal floor for Kitchen, Pantry, Bath Room, Laundry, Porch, Garage, Restaurant, Theatre, Hotel, Factory, Office Building, Railroad Station, Hospital—wherever a beautiful, substantial floor is desired. Several practical colors. Full information and sample FREE of cost and credit applied colors.

Imperial Floor Co., 65-67 East Ave., Rochester, N. Y.

A Success for 15 Years

MYSTIC EGYPTIAN LUCK RING

From ancient Egypt comes the Egyptian Luck Ring with mystic characters and sacred scarab bringing Life, Prosperity and Health to the wearer. Cleopatra is said to have worn one of these rings. Many people wearing them today, claim they bring success to men and admiration to women. Guaranteed Sterling Silver. Money back if not pleased. State Ladies or Gentlemen. Enclosed strip of paper fitting knuckle of ring finger. Order quick. Today. Cash \$1.45; C.O.D. \$1.65.
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**2 TIRES FOR
\$11⁹⁵**
**FREE TUBE WITH
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SENSATIONAL CUT IN STANDARD TIRE PRICES!

Two used tires for less than the usual cost of one, and a free inner tube with each tire! No double trouble or armed risks. Our big volume insures best tire values, and now send out your tire costs in two. Thousands of steady customers are getting dual mileage out of their tires and you, too, may get

You can get the maximum in tire wear. Order and prove it for yourself. Supply limited and order quickly now.

NOTE THE BARGAIN PRICES ON TWO TIRES OF SAME SIZE

Size	1 Tire	2 Tires	Size	1 Tire	2 Tires
10 x 3	\$ 7.25	\$11.95	12 x 3 1/2	\$12.45	\$21.45
10 x 3 1/2	8.25	13.95	13 x 3 1/2	18.05	22.45
10 x 3 3/4	9.45	15.45	14 x 3 1/2	14.45	21.45
12 x 3 3/4	9.45	15.45	15 x 3 1/2	14.95	21.95
13 x 3 1/2	10.65	16.95	16 x 3 1/2	14.95	24.95
13 x 3 3/4	11.85	18.75	18 x 3 1/2	16.45	24.45
14 x 3 1/2	12.45	20.90	20 x 3 1/2	16.85	26.95
14 x 3 3/4	12.95	21.45	25 x 3 1/2	18.90	26.45
16 x 3 1/2	14.95	25.95	27 x 3 1/2	18.45	26.95

SEND NO MONEY! Fill out C.O.D. envelope or post card, enclose this in airmail and if not fully satisfied return same at our expense and your money will be promptly refunded. Please mention straight side or clincher. DON'T DELAY! ORDER NOW!

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Spring is here! Now for the balmy jaunts to and from work with a DELTA to whiten the way.

No. 80 solves problem of rear red light—complies with all laws. Mounts left side front wheel under axle nut. No. 27 mounts on handle bar.

Ask your dealer or either model sent prepaid for \$2.25 complete (less Battery).

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Excell. Makers of Electric Lanterns, Automobile Flashlights, Bicycle Lamps, Flashlights and all kinds of Dce. Batteries, New York Winnipeg San Francisco

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For either metal or wood working—ideal for auto and electric repair shops, pattern and model shops. Because of their simplicity and compactness, we are able to build into each Baby Grand Lathe the same quality that characterized the older type of big lathes—and at a price within the reach of everyone, everywhere.

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King Instruments Now Easy to Own

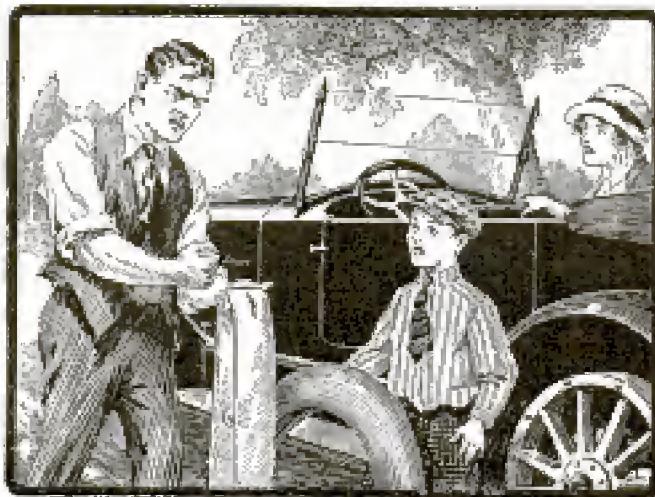
A quarter century ago the first King Brass Instrument was made to the specifications of a famous artist, and for years thereafter Kings were made and sold only for cash to great musicians. But now, our new easy payment plan makes it possible for anybody to own a King. You can now buy direct from the factory, save middleman's profit, and get a brand new, exceptionally perfect, laboratory-tuned King Instrument. And, with every new King goes our famous free factory-service and guarantee.

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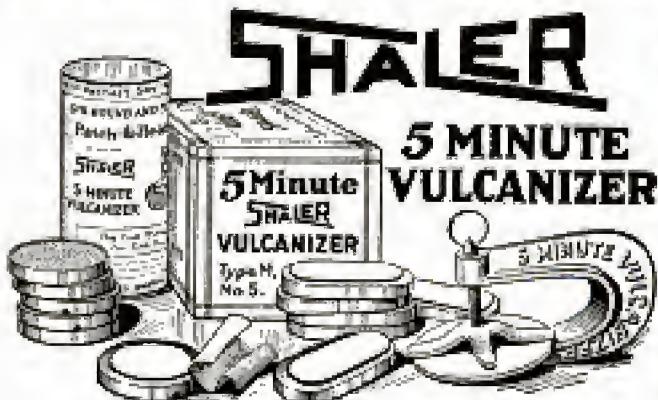
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Complete Outfit \$1.50 At All Auto Supply Stores

The outfit includes—the Shaler Vulcanizer, 12 Patch & Heat Units, with complete instructions. Extra Patch & Heat Units 75 cents a dozen. Prices slightly higher west of the Rockies and in Canada.

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BROADCASTING stations are now in operation at important centers all over the country. You can easily receive these interesting daily programs with an ABC wireless receiving UNIT. ABC UNITS come to you ready-to-operate and complete in every detail. They are built on the sectional system, so that you can increase the range of your station at any time.

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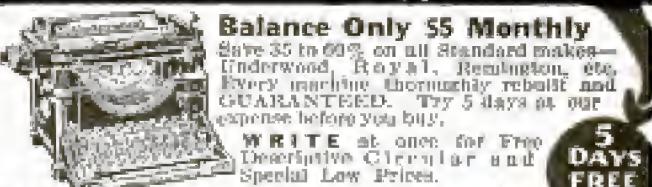
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The best Westinghouse can build.

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the best made. Positive-
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Rigidly supports the steering
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Are you worrying about your health, or that of any member of your household? Is any member of your family suffering from weakness, nervousness, "run-down" condition, rheumatism or aches or pains of any kind? If so, this book will be of great benefit. It tells in detail how nearly every common disorder can be overcome by simple home methods.

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With Our Great Introductory Offer
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Dress-Making Shears

Value \$1.25

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With each sale of our wonderful 11 piece Toilet Article Assortment for only \$1.75. TOTAL STORE VALUE \$4.60

\$18.00 a Day PROFIT on only TWENTY Sales



Lucky 11 Toilet Set—Retail Value \$3.25!

MY! HOW THEY SELL!

You get the attention with the free Shears. Walter Harris sold 800 boxes in six weeks. Profit over \$100 a week. You can do this too.

Act Now! Sell like hot cakes year round. A baby could sell Lucky 11. Don't wait a minute. Save time. Send \$1.75 for complete outfit including display case. At least write for circulars explaining our unique plans, including 50 other packages. **ACT NOW!**

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To trained men and women; we train you by mail; get 20 years' hotel experience in few months; earn \$8,000 to \$10,000 a year; one living; work is fascinatingly interesting; quick advancement. Send for FILED BOOK today!

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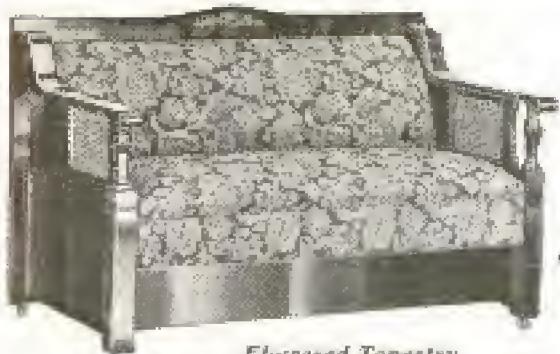
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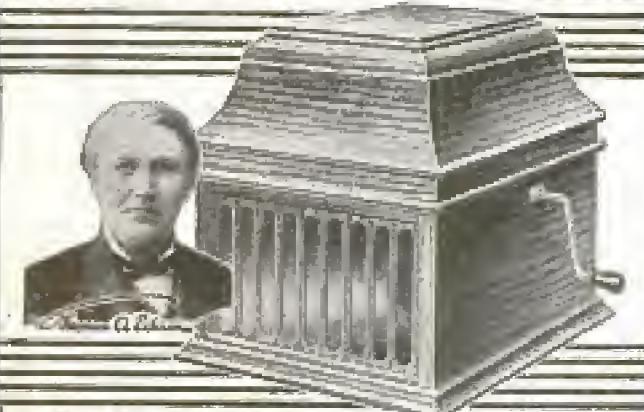
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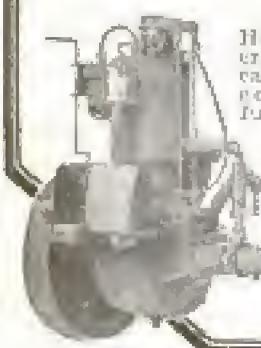
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Millions have been made on the 5c and 10c store idea because these coins are freely spent. Now comes the biggest penny sales idea ever hit upon and electricity has made it possible. A 1c vending machine with new process buttered P-Nuts in plain view. It keeps them toasted; and serves them HOT. Moreover, it flashes an electric sign all day long saying "Eat 'Em Hot—1¢."

Stands Out Like a Light House!

This sensational new type Sparta peanut vending machine absolutely compels attention. It gets the pennies by thousands, and serves fresh toasted Buttered P-Nuts so tempting that each customer repeats again and again. We have dozens of letters and affidavits stating that \$30.00 a month is easily made by ONE well placed machine and that **\$5720.00 a year is easily realized**. Want you make depended entirely on how many machines you have and where they are located, and remember, a reasonable sum of money puts you in the business right.

WE SHOW YOU HOW!

We give you 50 pounds of our own Buttered P-Nuts FREE OF CHARGE with each and every machine. This means you operate without peanut cost for the first 44 days. Your profits in 44 days will practically pay for each of your machines. We tell you how to place each machine to best advantage in theatre, clubs, depots, barber shops and many other crackjack locations. We send you free, by return mail, full and complete information on this great Business Offer.

But Remember The Good Territory Is Going Fast!

We give every operator A-1 exclusive territory. Consequently this splendid offer necessarily must be limited. Send coupon below to protect yourself in your territory and get full details without any obligation to you.

SPARTA MANUFACTURING COMPANY
10-30 Ionic Ave., Dept. 2215
Grand Rapids, Michigan

**50 Lbs.
Peanuts
FREE
to you
NOW!**

**MAIL TODAY
SPECIAL
FREE OFFER
COUPON**

SPARTA MFG. CO.
10-30 Ionic Ave., Dept. 2215
Grand Rapids, Mich.

Gentlemen:—Send without any obligation, full and complete details of your Great Offer on Sparta "Hot Flash" Peanut Vending Machines.

Name.....

Address.....

Territory.....
(Mention approximate territory desired)

Please Mention Popular Mechanics



RADIO BATTERIES

Your Radio Set is Only
as Efficient as Your
Battery Is Good

When installing a Radio Set do not neglect the quality of the battery you use. Universal Radio Batteries are built in three types, as shown, all with heavy long life plates and special finish for this kind of work.

Obtain from your dealer—if he can't supply you, order direct from factory. Write for special catalog.

BUILT RIGHT—PRICED RIGHT



TYPE WR

WR - 60 Amp	\$15.00
WR - 85 Amp	17.50
WR - 105 Amp	21.00



TYPE RR

RR - 60 Amp	\$19.00
RR - 85 Amp	21.00
RR - 105 Amp	25.50



TYPE GR

GR - 16 Amp	\$12.75
GR - 60 Amp	16.00

UNIVERSAL BATTERY CO.
3440 So. LaSalle St., Chicago, Ill.

UNIVERSAL
Batteries

BIG MONEY



Thousands of men with less ability than you are making from \$100 to \$500 a month in the business of sharpening safety razor blades. In big cities and small towns, with a small location on a busy street, the Velvet Edger starts to bring the money in right away.

No experience necessary, for you cannot get anything but the blistest shaving edges with the Velvet Edger.

Costs Little to Set Up in Business

What more for wages, when for the price of an old "Claw" you can set up in a permanent business, which will grow like any other well managed business?

Thousands of men around you are sharpening away their blades after a few days. You can make these blades sharper or better than ever for them, for half the cost of new blades. Gear made for you, and you quickly build up a trade with thousands of satisfied customers.

The booklet tells you why the VELVET EDGER turns out better work than any other machine. It shows machines for sharpening H. C. and Z blades at a time. It tells you what others have done. It shows you how to set up in business on a small capital. Writing protection is:

F. W. Gachran Mfg. Co.
5531 S. Vermont
Ave.,
Los Angeles,
Cal.



Enamelled Magnet Wire Single Cotton Covered Magnet Wire

	1 lb.	½ lb.	¼ lb.	1 lb.	½ lb.	¼ lb.
No. 22	.48	.28	.16	\$.98	.52	.30
No. 24	.55	.31	.18	1.05	.57	.32
No. 26	.60	.34	.20	1.21	.65	.36
No. 28	.64	.36	.20	1.36	.73	.40
No. 30	.68	.38	.20	1.70	.89	.48

LITZ WIRE, AERIAL WIRE

From 20c to \$1.25 per 100 ft.

Tubes for Tuning Coils, etc., etc., etc.

REEL EASY PRODUCTS

I. R. NELSON CO., Newark, N. J.

Only
\$15
Down

Play Well in
4 Weeks



Eight Months to Pay

Latest C Melode Saxophone outfit complete, only 100⁰ lowest price ever quoted. Sent on 6 days' trial. If satisfied, pay only \$10 a month for 8 months. No interest to pay—on account. Outfit includes sheet music (arranged and nicely bound), instruction book, album of popular recordings, 50 cent Music Box, carrying strap, mouthpiece and three reed boxes.

"Masterbilt" Saxophones

Highest quality, built in perfect tone, assembled and tested by experts. Has all latest key improvements, light, quick action and beautiful finish. Order direct from this advertisement or write for Free Catalog Folder today.

The Saxophone Shop, 427 S. Wabash Ave., Chicago
Largest Exclusive Dealer in Saxophone Supplies in the World.

No Delivering
Commissions
Same Day You
Take Orders.

**Dependable
Practical
Simple-**

Every
Home
Needs
It

\$5



Earn \$60 Weekly FOR ONLY FOUR ORDERS A DAY

EARNING \$60.00 a week is easy when you sell the Fugo Automatic Fire Extinguisher. Most agents earn more. You can understand how easy it is to sell when you realize that the

Fugo sells for \$5.00 while most extinguishers sell for \$15.00 or \$20.00 and are no more efficient or dependable than the Fugo. The Fugo is approved by many of America's most prominent Fire Chiefs. Millions of people want a handy, reliable fire extinguisher for their homes, office, factories, and garages. Agents take orders on every call. Some orders are for 3, 4, or 5 Fugos. There's nothing equal to it as a seller. A 5-minute demonstration and you pocket the order—No talking. No price argument. No competition. Field unlimited. Customers easily pleased. Sales multiply fast.

Read What New Agents Say

S. R. Kutz, of Hartsville, Ohio, writes: "I sold eight FUGOS in my first evening's work."

Henry Terp, of Green Bay, Wis., writes: "The FUGO is a superior extinguisher and by far the best seller."

Walter S. Nye, of Oneonta, N. Y., writes: "Ship twenty-four FUGOS immediately. Check enclosed. Have fifty additional orders for later delivery."

Wm. Pearson, of Norfolk, Nebraska, writes: "This is greatest agent's proposition we have ever handled. Wonderful money maker. At rate going now my sales organization will have no trouble selling 25,000 FUGOS the first year."

No Experience Needed

Our tested instructions guide you—you can't go wrong.—A five minute demonstration and it's sold. Your neighborhood fire department will recommend it. Boost it—push it.

Exclusive Territory

Become our licensed agent, control your own exclusive territory and employ sub-agents. You take in risk—you don't invest a cent. We deliver—you receive commission same day you take orders.

Experienced agents are fast dropping other lines to take up the Fugo proposition.

Write now for full particulars of the real possibilities that you have with the FUGO. Sample FUGO automatic free to every active agent.

The Ohio Instrument Co., 9414 St. Catherine Ave., Cleveland, Ohio

FUGO AUTOMATIC FIRE EXTINGUISHER

40,000 Opportunities in Hotels

Nation wide demand for high salaried men and women! Don't experience disappointment; we train you by road and put you in touch with big opportunities. Big pay, big living, interesting work, quick advancement; permanent. Write for Free Book, "Your Big Opportunity."

LEWIS HOTEL TRAINING SCHOOL, Room 328, Washington, D. C.

THE BUSINESS FOR YOU!

Make and sell Crispettes, delicious confection. Everybody loves them. Can't get enough. Come again and again for more. Easy to make. I furnish everything. Raw materials plentiful and cheap. Profits enormous.



Quick success possible anywhere—cities, small towns, villages. Amazing market—crowded streets; surging through at fairs, carnivals, parks, etc.; wholesales to grocers, bakers, druggists, and so on. Possibilities unlimited! Need no experience. Little capital starts you on road to phenomenal earnings.

WRITE—GET MY HELP—BEGIN NOW!

Others are making money—lots of it. Letters just received during this week tell of wonderful successes. You can succeed, too. Start in all you need. I'll gladly help you. Furnish everything—complete outfit, materials, secret formula, full directions, samples, etc. Send post card for illustrated book of facts. Tell how to start. Reprinting most successful methods. Gives all information needed. It's free. Write now!

LONG EAKINS COMPANY
528 High Street Springfield, Ohio

A REAL BOAT FOR REAL FISHERMEN



The MOTO-ROW \$250

COMBINATION power and row boat, distinctly new all-purpose craft built of selected airplane spruce, copper riveted. Two-hp. motor protected under stern deck. Sheer and full bare insure dryness in amassing sea. Reinforced skeg permits beaching. Dimensions 16x4 ft., speed 7 M. P. H., 6 passengers. Salt water equipment \$25 extra.

Write for Illustrated Catalogue.

**BELLE ISLE BOAT & ENGINE CO.
DETROIT, MICH.**

GUARANTEED UNCONDITIONALLY TWO YEARS



6-Volt 11-Plate	6-Volt 13-Plate	12-Volt 7-Plate
\$12.50	\$14.50	\$18.50

These three types fit 95% of all cars manufactured. When you order from us you deal direct with the manufacturer and get 100% Storage Battery at a saving of 50% on the usual cost.

RICHMOND-SPECIAL FOR WIRELESS 4-VHL 100-Amp. H., \$11.50

RICHMOND BATTERY CO., Inc.
No. 104 E. BROAD STREET RICHMOND, VIRGINIA, U. S. A.

Make \$200. to \$1000. Profit Monthly

With Balba Perfume Sales Machines

People love perfume. Men, women and children will buy Balba. Its fragrance is soft and lasting and it is easily accessible. Just think. Grown-ups and boys and girls spent \$250,000,000.00 in one year in the United States for perfume, alone, at toilet counters. Consider how much more will be spent when a dime placed in a Balba Sales Machine will bring forth a conveniently sized bottle of rare Balba Bouquet Perfume. Balba Sales Machines, the serve-yourself idea applied to perfume sales, are popular. One machine holds 124 bottles, and between 3 and 4 people use it daily, with a profit to the owner of \$4.00 per machine per month. 100 machines bring in \$400.00 profit per month and can be easily handled in spare time.

BALBA

Bouquet Perfume

Of rare and lasting quality, Balba Bouquet radiates a fragrance of elegance and refinement about the wearer. Hundreds of regular customers buy from Balba Sales Machines, 5 to 12 bottles of the soft, rich Balba perfume at one time, because they can carry them easily in hand-bag, or pocket.

25c to 50c Value for 10c a Bottle

Because all middlemen's profits are cut out by the serve-yourself sales plan of Balba Sales Machines, we can manufacture this high quality perfume in large quantities and give 25c to 50c value for 10c a bottle.



Sold Only Through Balba Sales Machines

To give highest quality, and largest quantity at lowest cost in an inexpensive bottle, Balba Bouquet Perfume is sold only through Balba Sales Machines, on the serve-yourself plan, cutting out all overhead expense. Note the attractively nickel-plated, practically thief-proof, easy to fill, simple to operate, Balba Sales Machines. Weather-proof, used inside or out in small space on wall or counter.

We Want Balba Sales Machines in Every City, Town and Recreation Resort

We have thoroughly proved that Balba Bouquet Perfume is a good seller; it repeats; it makes new users. Balba Sales Machines in good locations show an increasing business, proving that the serve-yourself plan applied to perfume is a safe, sane, logical selling method. We are offering a tested, proven, big profit, permanent business to a live person, man or woman, in each territory. Instead of territory rights, we sell an allotment of Balba machines in proportion to population. We give the purchaser exclusive rights to sell Balba perfume in that territory. No perfume but Balba is sold like this. Balba is being advertised Nationally.

Over 500 Cities Already Taken

Over 500 towns and cities are now under contract. Every mail brings new contracts—Machines are now being shipped in large quantities and being put up daily and National Advertising is being placed—the contracts are going to men of action and vision—thousands of good cities and enclaves are still open but it will take quick action.

Baltimore, Cincinnati, Pittsburgh, Buffalo, Des Moines, Los Angeles and Springfield, Mass., are some of the towns taken.

FREE Newspaper Advertising in Your Territory

When you have bought and placed a full allotment of Balba Sales Machines, we will run advertising in your local newspaper, giving locations of all your Balba Sales Machines. This starts people buying Balba from your machines, and the high quality of Balba keeps them buying. We tell you how to place machines and handle them. We are rapidly getting general distribution, and are placing advertising in the National Weeklies and Women's magazines to make perfume users throughout the U. S. want to buy Balba.

Guaranteed 100% Earnings or Money Refunded

Our proposition as well as our perfume is guaranteed. We guarantee 100% earnings on the original machine investment the first year, provided machines are all placed in use and kept filled, or we will refund the original price of the machines and perfume then on hand, and take them back.

THE BALBA CORPORATION of AMERICA

Suite 45, Balba Bldg., Toledo, Ohio, U. S. A.

THE BALBA CO. OF CANADA
Lemington, Ont.



WHERE BALBA MACHINES CAN BE PLACED

Theaters	Bath Houses	Street-Rides Parlors
Pool Halls	Factories	Lunch Cafeterias
Drapery	Beer Rooms	Skating Rinks
Clubs	Dance Halls	Ticket Offices
Hair-Salons	Lodging Rooms	Street-Car Shelters
Catering	Candy Shops	Ice Cream Parlors
Drug Stores	Hotels	Office Building Lobby
Gift Stores	Moving Pictures Houses	Passenger Busses
Fruit Stand	Billiard Parlors	Recreational Buildings
Street Cars	Apartment Houses	Waiting Rooms
Blenders	Public Buildings	Hotel Rooms
Trolleys	Bowling Alleys	Hotel Lobby
Parked	Automobile Clubs	Barber Shops

READ WHAT BALBA SALES MACHINE OWNERS SAY

George Schroder, Ohio, says, "First 150 Balba Sales Machines averaged \$100.00 clear profit last month, before advertising was started." Maxine, Michigan, says, "First 20 machines put up, average 3 plays daily. This last at the rate of \$200.00 clear profit monthly without advertising."

Send 10c Coin or Stamps

With name and address for full size bottle of Balba Bouquet Perfume. This offer is open to any one.

Get the line in your territory to teach a Person to Balba. Get complete information, literature and sample of Balba. Write today, or better wire us to hold territory until you are our proposition. Read what Balba Bouquet's Owners say and send for your literature. Now.



Campers! Tourists! Picnickers!

Your outing equipment is not complete without a

Campfire Grub Stake

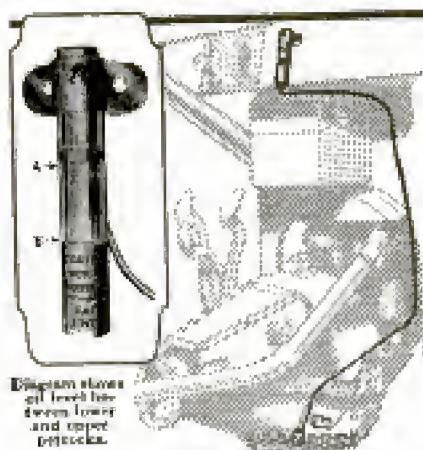
The handiest article of its kind ever produced. Light, strong, compact and portable. Can be set up anywhere in one minute. Three adjustable racks for skillets, pots and pans, that can instantly be raised, lowered or turned according to direction of wind. Racks stay in position without set-screws or lugs. Guaranteed for life.



On sale wherever Outing Goods are sold.....
\$3.50 In U.S.
\$4.00 in Canada

If your dealer cannot supply you, write us direct, enclosing \$3.50 together with dealer's name, and the Campfire Grub Stake will be sent anywhere in U. S., postpaid. Order at once.

CAMPFIRE MFG. CO.
1036-A Boatman's Bank Bldg. St. Louis, Mo.



No Oil Passes
from Crank
Case Thru
Tube or
Gauge

You Can Easily
Install The
Accurate
**Carter Oil
Gauge**

FORD TYPE: CHEVROLET TYPE (438 and F. A.)
Simple outfit consisting of special elbow to screw in place of lower petcock; connecting air tube and nickel-plated gauge to screw on dash or instrument board.

Liquid in gauge is controlled by column of air that rises and falls as oil in crank case changes level. When liquid in gauge is at "A" level, oil in crank case is at upper petcock level; at "B" it is at lower petcock level.

No floats, plungers or moving parts to get out of order; positively accurate in any weather.

Gauge complete packed in attractive carton with instruction sheet, retail price \$3.00 including mail cost. Convenient distribution or money refunded. If more dollar cannot supply, we can remanufacture and order. Mention name of your regular dealer.

JOBBERS AND DEALERS—Write for descriptive and sales help.

CARTER MOTOR ACCESSORIES, INC.

386 Pearl Street — Get On Copper Here — Buffalo, N. Y.

**CARTER MOTOR
ACCESSORIES**

Condition — Enclosed Ind. (Check) P. O. or Exp. M.
Oil for 5.....
Carter Oil Gauge—Ford Type
Carter Oil Gauge—Chevrolet Type

Name.....
Street.....City.....
Write name and address of your dealer in margin.
From Popular Mechanics
(If this coupon is used by dealer, we will send shipment C. O. D. including a copy of advertising literature plus a demonstrating dealer's card with order for one dozen of each.)



The NELSON Ball Bearing Timer

Does away with all Timer Troubles on Fords

*The Nelson Timer is
guaranteed for 100,000
miles on any Ford*

Countless thousands of Ford owners have demonstrated that the patented Nelson Ball Bearing Timer is positively trouble proof and that it will outwear a Ford car.

The large Nelson Ball Bearing Brush revolves at 1/30 the speed of the ordinary Timer brushes.

Due to the large brush or roller on the Nelson Timer, the contact ring never gets bumpy, the contact seg-



Price \$3.50

At your Dealer's or postpaid

ments never glaze over with oil and the fibre never spreads over the contact segments.

The Nelson Timer insures perfectly timed ignition for the life of the car, for this Timer never requires adjustment and has no delicate parts to break or wear out.

DEALERS ATTENTION—During the past seven months more than 3,000 dealers have taken on the sale of the Nelson Timer. This is a remarkable recommendation not only for the Timer itself but for our selling proposition. The Nelson positively sells on sight.

Write today and ask us to send you sample half dozen C. O. D. at dealer's price.

Nelson Timer Co. 631 East Water St. Milwaukee, Wis.

RADIO For Everybody

Don't be satisfied with putting around with Radio. You can earn big money. Learn by mail, in spare time, how to design, construct, install, repair, maintain, operate, sell and demonstrate complete radio outfits. Write for our book, "How to Learn Radio at Home," National Radio Institute, Dept. 1065, Washington, D.C.

W BUILD YOUR OWN E WIRELESS TELEPHONE

This wonderful invention now within the reach of all. Hear free music, latest news, lectures, market reports, broadcast through the air, day and night, by radio. Afford real pleasure and education to the whole family the year round. Hear New York, Pittsburgh, Chicago and all large cities. Learn "Wireless" operating at home and earn up to \$5000.00 a year. Make a "Universal" long distance set and save \$50.00. Simple as A-B-C. Has wave length range of 170 to 2,500 meters, receives signals from all over U. S. uses bulb and 2 stage amplifier. Constructed entirely in wood \$100.00. Larger book "Wireless at Home," by celebrated engineer, just \$1.00, if ordered at once. This price includes instructions, list of parts and prices of each, complete to build and operate, sent by mail, prepaid for only a one dollar bill. Price \$1.00. Order now today. Thousands sold. American Radio Co., 21 Warren St., New York, N. Y.

\$3.50 U. S. SPRINGFIELD RIFLE

Breech Loading
Made by U. S. Government
WILL HIT THE MARK HALF-MILE
45 calibre—41 in. long—1½ lbs.—Cost \$16.00, price \$3.50
These guns have been used but are in first class condition.



Exchangeable shot gun barrel like above cut all complete ready to put on carbine stock in minutes for \$3.00. This gives wonderful combination for all year shooting. No other gun made to equal it. We have 3,000,000 rounds ammunition standard and produced by leading cartridge makers. Our price 45/70 ball cartridges for carbine, \$3.00 hundred. Also loaded No. 8 bird shot cartridges for shot gun, \$3.00 hundred.

W. STOKES KIRK, Dept. 2, 1627 N. 10th St., Philadelphia, Pa.



Yankee VIOLET RAYS

The value of Yankee Violet Rays as a curative agent is without equal—they are the greatest force for health and beauty that science has yet imagined; today they are almost as essential to your health and well being as sunshine and fresh air. The stimulating effect of these rays is powerful enough to reach and benefit every part of the body yet so absolutely harmless that babies are treated with it with wonderful results without the slightest shock or pain.

Our Perfect Home Outfit for Bodily Ailments NOW HALF PRICE

This perfect Home Outfit until now sold regularly for \$25. It is a self-contained one-piece machine, simple in construction, easy to operate, nothing to get out of order, and absolutely guaranteed for one year. Works equally well on alternating or direct currents; will last a life-time with ordinary use. It includes the Yankee Home Outfit generator, a general applicator, 6 feet of cord, with attachment plus and chart all contained in an elegant imitation leather carrying case.

Is Your Body Sick or Worn Out?

Is your body sick or worn out by excessive strain? Do you know the use of a Yankee will accomplish more beneficial results than a cabinet full of medicine or a violent course of exercise? Do you also know that in order to destroy or eradicate any disease it is merely necessary to build up the tissue resistance with a Yankee Violet Ray applicator and nature will do the rest?

SEND NO MONEY Sent on 5 days Free Trial

Fill in the coupon at the foot of this page and mail it to-day. The entire amount involved is only \$12.50 and even that does not have to be paid until actual delivery of the outfit has been made. Send no money with your order. Remember, if for any reason you feel that you do not wish to keep it just pay return it within 5 days after receipt for a refund of your money. We take all the risk.

**SEND FOR
FREE BOOK
YANKEE VIOLET
RAYS**



**WRITE FOR
YOUR COPY
TODAY**

Formerly \$25
Now Reduced to
\$12.50

Nothing Better for

Dandruff
Baldness
 Falling Hair
Itching Scalp
Soreness of Skin
Massage
Eczema
Obesity
Rheumatism
Lumbago
Gout
Headaches
Weak Eyes
Insomnia
Neuralgia
Grippe
Influenza
Catarrah
Difficult Breathing
Stomach and Liver Troubles
Pleurisy
Diabetes
Skin Diseases
Rectal Troubles
Constipation
Nervous Troubles
Hay Fever
Deafness

— USE THIS COUPON —

To YANKEE LABORATORIES, Inc.
318 East 40 Street, New York City, N. Y.

Please send me the Yankee Violet Ray Outfit by mail or express collect—\$12.50. I am to use this outfit for 5 days and if I am not satisfied with it you are to return my money upon your receipt of the outfit in good condition.

Name _____

Address _____

These ailments and hosts of others respond like magic to the disease destroying influence of this wonderful appliance.

Bausch & Lomb Prism Binocular \$22.50



This extra powerful binocular (6x30 mm.) is equipped with extremely sensitive lenses, affording an unusually clear view of distant objects. Each eye-piece is adjusted individually, thereby suitable to all eyes, also has central adjustment with scale. Made of solid brass, handsomely finished with hard rubber with leather shoulder strap, solid leather carrying case and straps. No. 2403 for \$22.50.

All our Merchandise is Brand New. Order one of these special items. Reply Mail, Small Orders promptly filled (Charges Prepaid) when accompanied by Money Order or Bank Draft, or if you prefer **SEND NO MONEY**. For Business or arrival. Our price is posted. Remainder understand entirely and if not satisfied just return same and get your MONEY BACK without any red tape whatever. Back reference.

EDWARDS IMPORT TRADING CORP.

Genuine BUSCH Jagdglas \$16.25



A five power, extremely powerful, hand-made and well made field glass made by Busch (Germany), needs no introduction, as they are known the world over. These famous glasses are a short distance from unsurpassed at any price. They are unusually light and compact, made of solid brass, covered with genuine moreskin leather and finished with hard rubber. Solid leather carrying case and straps. No. 2508 for \$16.25.

Lomora Prisma Binocular \$25.00



Equipped with central and individual focal adjustment, lenses extremely sensitive; can be instantly adjusted to any eye. These binoculars have an unusually long range (6x24 mm.). They are handsomely made of solid brass, covered with moreskin leather, with shoulder strap and solid leather carrying case and straps. No. 2609 for \$25.00.

Illustrated Catalogue on Request

258 Broadway, Dept. 9, New York City

3000 Bargains

Big Free Catalog

Know the latest prices before you buy. Send for our illustrated price book. Every page is filled with Bargains. We buy for Cash—and sell for Cash.

Save Money on Special Bodies

We carry a complete line of body bodies for Ford and Chevrolet. 1400+ part numbers. Prices Savings and up.

This Book
FREE

AUTO SUPPLIES FOR ALL CARS



NEMCO BARGAIN SUPPLY HOUSE
1917 W. Jackson Blvd., Chicago, Ill.

Lowest Prices on Two-Year Guaranteed

BATTERIES \$14.95



For Ford, Studebaker, Chevrolet, Packard, 517.79 for Buick, Overland, Essex, Reo, Hudson, Nash, \$21.95 for Maxwell, Dodge, similar prices for all other cars. The Defiance is one of the highest standard batteries, made by one of the oldest standard battery companies in the world. Sold direct from maker to you without a single extra profit to be had.

Defiance Battery at \$14.95 is an excellent A.A. radio battery.

Send us money. Order direct from these prices being sure to give name, model and year of car, and battery will be sent same day by express U. S. A.

DEFIANCE BATTERY COMPANY

Direct Sales Department 12

728 Huron Building, Chicago

WANTED TAILORING SALES AGENTS

Make big money from very start—\$75.00 to \$100.00 weekly. Largest made-to-measure tailoring house, furnishing all equipment of fine lined woolsens, woolens you to take orders. Rehabilitation guaranteed. Biggest merchants in many cases have started with our line. If you want to establish yourself permanently in business and make big money, write for full particulars, giving your experience as salesman or tailor's sales agent.

P. M. HORN, Sales Manager, Lock Box 483, Chicago

A Real Professional Model, Horsehide Fielder's Glove

This glove is a real *professional* model, made by a house which outfits big league teams and well-known college teams. We have been making sporting goods for seventy-five years and selling them *direct to the user*, giving you the middleman's profit you pay in stores. Made of *genuine* pearl horsehide. Leather lined throughout. *Full size* and carefully padded to form a perfect ball pocket. Rawhide laced heel. A man's glove—stands the gaff. Send \$3 and if you can buy as good a glove in any store for \$5, return the glove and we will refund your money. Send for catalogue.

HORACE PARTRIDGE CO., Dept. A, 49 Franklin St., Boston, Mass.

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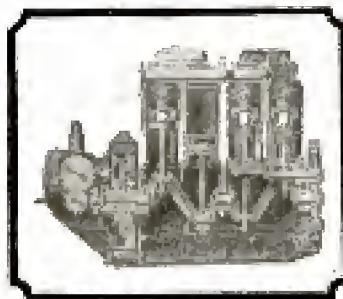


Diagram of the Ace Four Cylinder Motorcycle Engine.

Comfort-Speed-Silence in this Marvelous Motor

MOUNTING steep hills with a silent, steady flow of power—covering great distances with new ease and comfort—the Ace Four Cylinder Motorcycle carries you past the mile posts with lightning-like speed.

The new Ace gives you freedom from troubles and independence for the long tour or the short, quick ride to a nearby destination—in fact a new kind of transportation.

When you mount the flying Ace, you are Master of the highway. Here is a new pick-up-and-go as you worm your way through the most crowded traffic, waiting for a chance to shoot out ahead with the ease of a transcontinental limited. And, off over the hills you may have a slow ambling gait through beautiful countryside as your Ace throttles down in submission.

Don't waste any more days when you ought to be out in the open; don't waste any more time for lack of the surest and speediest transportation. Have a demonstration of the Ace Four Cylinder Motorcycle today.

If you don't know the Ace dealer send for illustrated descriptive catalog and we will refer you to him.

ACE MOTOR CORPORATION
Erie Ave. and Sepviva St., Philadelphia, Pa., U.S.A.

Attractive terms of payment will be arranged for you by Ace Agents. Write us for particulars.

ACE



"E-Z" FOR YOU

Most Useful
Device on
Earth



\$1



Over 30,000 Business and Professional
Men, Mothers and Nurses save
TIME, MONEY and WORRY over
WASTED HOURS spent in barber
shops. That's why we say **YOU**.

\$1.00

Price in
Canada
\$2.00

The "E-Z" Combining HAIR CUTTER-SAFETY RAZOR makes them independent. **CUT YOUR OWN HAIR** in ten minutes. Adjustable for long, short, tapered or graduated. No electric needed. Just shave yourself like **YOU** want. No SPIT before. Cut any style, hairy face, shaveable for ONE-ARM men, right or left handed persons. **EASY SHAVES**, prevent you ever fail. Two way **SAFETY RAZOR**—safe for LADIES—new safety guards blade covers for working under arms, over biceps, before spots and behind ears. Barber and Mother find it convenient and safe for the child. Lifetime durability. Genuine SILVER PLATE, complete with one extra blade. Three months' service paid through DEALERS or direct by mail upon receipt of price plus \$1.00 postage. Extra blades. Mail DEALERS WRITE. Sales Agents Wanted in U. S. and Provinces of Canada. Mention your dealer's name.

J. H. COWAN CO., Dept. TD, K-C Life Bldg., Kansas City, Mo., U. S. A.

COWAN SALES CO. OF CANADA
Dept. 7, 1317 Garret St., Regina, Sask.

FREE
TUBE
with
each
tire



New
Cords
Slashed
To
\$9.95

GUARANTEED
10,000-Miles

BIG FACTORY SALE—Brand New Strictly Firsts

These strong, thick cords, cords made from fresh stock at 20% savings. Absolutely Brand New—still in original wrapper with manufacturer's name and serial number on every tire.

Guaranteed 10,000 Miles

and adjusted at the list price on a mileage basis.

These prices include *Tire Tax*.

Size	Price	Size	Price
26x3	\$7.95	25x4	\$7.95
26x3½	11.95	25x4½	10.95
25x3½	10.95	24x4	10.95
25x4	13.95	23x4	13.95
25x4½	13.95	23x5	13.95
25x5	13.95	22x5	13.95
25x5½	13.95	22x6	13.95
25x6	13.95	21x6	13.95
25x6½	13.95	21x7	13.95
25x7	13.95	20x7	13.95
25x7½	13.95	20x8	13.95
25x8	13.95	20x8½	13.95
25x9	13.95	20x9	13.95
25x9½	13.95	20x10	13.95
25x10	13.95	20x10½	13.95
25x11	13.95	20x11	13.95
25x12	13.95	20x12	13.95
25x13	13.95	20x13	13.95
25x14	13.95	20x14	13.95
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25x206	13.95	20x206	13.95
25x207	13.95	20x207	13.95
25x208	13.95</		

*Actual photo
of one of
our rebuilt
Underwood
Typewriters.*



\$3 DOWN And It's Yours

Standard Underwood

Rebuilt like new. Every typewriter is factory rebuilt by typewriter experts. New metal—new plumbing—new leather—new plates—new key caps—new parts wherever needed—making it possible for you to tell it from a brand new Underwood. An up-to-date machine with improved ribbon, back space, stencil device, automatic ribbon reverse, bellows, etc. In addition, you furnish FREE waterproof paper and a special Typewriter Instruction Book. You can learn to operate the Underwood in a day.

**Typewriter Emporium
Shipman-Ward Mfg. Co.**
2125 Shipman Bldg., Montrose and
Ravenswood Aves., Chicago, Ill.



All shipments made direct to you
from our big modern factory
(shown above)—the largest typewriter rebuilding plant in the world.

From factory to you

Yes, only \$3 brings you this genuine Rebuilt Standard Visible Writing Underwood direct from our factory, and then only small monthly payments while you are using it makes it yours; or, if convenient pay cash. Either way, there is a big, very much worth-while saving, too. Genuine new Underwood parts wherever the wear comes

—genuine standard four row, single shift keyboard—thoroughly tested—guaranteed for 5 years.

\$3 Puts It in Your Home

You don't even have to scrimp and save to pay cash. Instead, you pay only a little each month in amounts so conveniently small that you will hardly notice them, while all the time you are paying,

you will be enjoying the use of and the profits from the machine.

10 Days' Free Trial

Remember, you don't even have to buy the machine until you get it and have used it on 10 days' free trial so that you can see for yourself how new it is and how well it writes. You must be satisfied or else the entire transaction will not cost you a single penny.

Use Coupon

Now is the time when every dollar saved counts. Let us save you many dollars. Don't delay. Get this wonderful easy payment bargain offer now, so you can send for and be sure of getting your Underwood at a big saving—and our easy terms or for cash.

**Act Now—
Send Coupon Today!**

FREE TRIAL COUPON

**Typewriter Emporium
Shipman-Ward Mfg. Co.**

2125 Shipman Bldg., Montrose and
Ravenswood Avenues, Chicago, Illinois

Send by return mail Rebuilt Offer No. 2125 of a Standard
Visible Writing Underwood. This is not an order and does
not obligate me to buy.

Name.....

Street or
R. F. D. No.

City State

IVER JOHNSON BICYCLES



*A 20-minute walk
a 5-minute ride*

What a convenience is an Iver Johnson bicycle! Sleep a few more minutes in the morning—take a little more time at breakfast—then hop on your bicycle for a bracing ride to the station. No more missing the train.

And at night, instead of a tiresome walk home from the station, another short ride to put you just right for a good dinner.

The truss-bridge frame, seamless tubing of nickel steel, drop-forged parts, two-piece crank set—these are some of the features that guarantee the strength, speed, and durability of every Iver Johnson bicycle. The oldest firm in America making bicycles continuously.

Write at once for free Bicycle catalog "B 4." Firearms catalog "A 4" also sent on request.

IVER JOHNSON'S ARMS & CYCLE WORKS, 4 River Street, Fitchburg, Mass.
New York Office: 99 Chambers St. San Francisco Office: 717 Market St.



Ask your dealer to show you the Iver Johnson Champion single barrel shotgun. Accurate, dependable, moderately priced.



Keep an Iver Johnson revolver in the home for self-protection. It's accident-proof—you can "Hammer the Hammer." Quick, accurate, safe.



**Sent to you
on
free
trial**

The Famous YORK SAXOPHONE

The Easiest
Instrument
to play!

Yes, that is exactly what we mean. You can have the World Famous York Saxophone shipped to you on **10 days' free trial**. Play on it at home to your heart's content for 10 full days. We want you to convince yourself of its superb quality, richness of tone and ease of playing.

And then, if our instrument does not completely sell itself to you, simply ship it back to us at our expense. The trial will not cost you one penny.

TAKE YOUR CHOICE

York makes every instrument used in the band, and for nearly half a century the greatest professional musicians have purchased and endorsed them. You can get **any one** of these good band instruments made by the House of York on **10 days' free trial**. No obligation to buy. Send the coupon below for beautifully illustrated literature and take your pick of the following:

Cornets
Baritones
Clarinets

Trombones
Saxophones
Drums

Trumpets
Altos
Basses

ON EASY PAYMENTS

You can pay while learning to play. Simply make a small payment down, and you can pay the balance in monthly remittances—a splendid opportunity for you to secure a quality instrument at a reasonable price and on easy terms. We send you everything you need, including carrying case and all necessary attachments.

Send this Coupon Now!

Fill out the coupon **now** with your name and address and mention the instrument you are interested in, and we will send you the illustrated literature and the full details of our Free Trial Offer and Easy Payment Plan.

This literature tells you **how to practice and how to learn to play**. It's yours for the asking. **Send the Coupon today.**

J. W. YORK & SONS

Dept. 2215, Grand Rapids, Mich.
(Makers of good Band Instruments since 1882)

FREE COUPON

J. W. YORK & SONS

Dept. 2215

Grand Rapids, Michigan

Gentlemen—Kindly mail, without cost to me, your beautifully illustrated literature on the famous YORK Band Instruments, and the full details of your Free Trial and Easy Payment Offer.

Name.....

Address.....

Instrument.....
(Mention instrument in which you are interested)

Copyrighted material

Here's Your Chance!

Work for Yourself! Build a Big-Profit Business! Write -or MAIL COUPON-TODAY

Mr. Albert Mills, President American Products Co.,
6699 American Bldg., Cincinnati, Ohio

Dear Mr. Mills:-

Please send me details of your plan for starting me in business and how I can get a Ford auto.

Name

Address

HERE are thousands of men and women dissatisfied with their lot, tired of the daily grind, long hours, just making a living, who say to themselves—"If I only had a chance, if I could only get a start, I know that I could improve my condition, do more for my family, enjoy life, and lay away something for a rainy day! But, I never had any experience except in my old job, and I have no money to go into business." If you are among these, take courage—I offer you the chance you want—on only one condition—that you are honest, willing to work and determined to stick. If you just have these qualities, the lack of schooling, of experience in business, or of capital, will not stand in your way. The chance I offer you is to become a

Direct Factory Representative

for the ZANOL line of "Quality First" Pure Food Products, Toilet Preparations and Household Necessities. These are produced in our own Laboratories and Pure Food Kitchens (see picture at the right). They are known to the housewives of America through our National Advertising in the leading magazines, and are distributed only through our own Direct Representatives. You can build up, as others have done, in a short time, a regular list of customers, who will order over and over again, piling up big profits for you.

NOTE—This is not a get-rich-quick scheme, nor a plan to get you to invest a lot of money. Just a straight-out offer to start you in a business of your own, in which even beginners often make from \$5 to \$10 a day profit. If you are willing to work hard and to stick till you win out—send the coupon or drop me a postal to get full details. I want no money—just your name. Write me Today—Sure.

ALBERT MILLS, President

THE AMERICAN PRODUCTS CO., 6699 American Bldg., Cincinnati, O.

Special Free Ford Offer

In addition to the generous profit which you make regularly as the "Zanol" Representative, we give you a Ford automobile absolutely FREE. This offer is the greatest and most liberal ever made by a reliable and responsible concern.



Do We Make Good? Read These!

I have received the Ford Touring Car which you sent me and am much pleased with it. I thank you for your straightforward way of doing business. I won the Ford mostly in spare time as I work three days a week in the shop.

EDGAR BAXVILLE,

Mass.

Words cannot express my feelings toward you for the gift of the Ford Car. I will say yours is the most reliable company I ever worked for. They are men of their word. I have been their Representative six years and have built up a good trade.

W. C. FULTON, Ohio.

I want to say that I am certainly pleased with my car, and wish I could see all of your representatives and just tell them how honest you have been with me and how faithful you are in all your undertakings and promises.

BESSIE NOWLIN,

Ky.

IN SCHOOL OR SHOP—this Outfit will Start You Right



Thousands of Young Men Have Bought this Book 180 pages of easily understood information and special tables invaluable to machinists' apprentices and students. Copy sent postage paid to any address, 25 cents.

In learning to work metals within close limits, here's two good rules for every beginner:

*Be sure of your tools.
Be sure of your methods.*

Starrett Tools and the Starrett Book for Machinists' Apprentices will start you out right on both counts.

Copy of Starrett Catalog No. 22-A describing and illustrating 2100 fine precision tools—also copy of special Supplement to the Catalog showing latest additions to the Starrett line—sent free on request.*

THE L. S. STARRETT CO.
*1st World's Greatest Toolmakers
Manufacturers of Hand Tools, Dividers &c.
ATHOL, MASS.*

Starrett Tool Set, No. 901

Epecially designed for use by students and apprentices. A thoroughly practical set of fine tools recommended by the teachers and master machinists. See the Starrett Catalog No. 22, for details.



Use Starrett Tools



No wonder salesmen are making fortunes with this amazing invention that saves housewives from roasting kitchens in the summer. It turns any coal range into a gas stove. Just a turn of the valve instantly gives them as much or as little heat as they need—three times the heat of a coal fire if they want it. That's why the Oliver Improved Oil-Gas Burner is sweeping the country like wildfire! That's why Salesmen are cleaning up on it.



Easy to See Why New Invention Brings Salesmen \$50 a Day

A Whirlwind Summer Seller!

PUT yourself in the position of one of the millions of American housewives who have to sweat and fume and fuss over a hot mussy coal and wood stove in a roasting kitchen in July. Then you'll see why housewives all over the country are clamoring for this amazing new invention! And knowing what such a nation-wide demand means to salesmen or agents you know at once why the men and women who represent the Oliver Oil-Gas Burner are making fortunes.

It isn't hard to sell a thing that everybody wants! You don't have to be a star salesman. You don't have to talk people into a sale. A short, clear-cut demonstration—the sale is made—and the profit's in your pocket.

Salesmen make big profits with the Oliver because it hits the spot at a time when women are looking for and buying every device they can get that will save them labor. The Oliver saves a woman the drudgery of hauling coal and wood, building fires, and cleaning out ashes, at a time when she is looking for just such a labor saver. It makes an immediate hit with her because thru **just a turn of a valve**—just like a gas stove—she gets just as much or as little heat as she wants.

Another thing, the Oliver burns 95% air and 5% oil, the cheapest fuel there is—it really is not a mere kerosene wick-burner. A new invention turns the oil and air into a gas. It is the gas that burns.

Now that you know these things you can understand why agents make profits as shown in their actual letters on this page. There are hundreds of others: W. H. Drew of Michigan made \$85.00 in one day. L. Zucher of Ohio made \$21.50 in three hours. R. Berger of

Oliver Oil-Gas Burner & Machine Co.
2014-Q Pine St., St. Louis, Mo.

Please send me full facts about how I can make big money representing you in my territory. Also your plan if I wish to make big money in my spare time.

Name _____

Address _____

Ontario earned in one week \$258.50. Big money can easily be made just in spare time. N. Browne of Washington made \$43.00 in one evening.

Quick Sales—Big Profits

These men know a good thing when they see it and they know that the time is ripe for this new Oliver Improved Oil-Gas Burner. They know that this age of high-priced coal and wood makes it necessary for some substitute. They see ships and locomotives being run by oil, and big buildings being heated by it. And they know that an invention that makes effective use of this cheap fuel for every house and at the same time frees women from the drudgery of wood, coal, sweltering kitchens, and ashes, is the thing they want to tie up to. You, too, can use this secret of big money.

No Experience Needed to Make Big Money

You do not need to be a high-powered salesman. The Oliver's amazing features sell it for you. When people see it they know at once that it is the thing they want. You will realize that this is a proposition that will pay you as big money as it does others. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight but our salesmen find that every time they sell one, this one will sell several others as soon as your customer's friends and neighbors see it. And thru our special plan you get credit and commission on all these extra sales that you don't even have to make—commission for every sale in your territory.

COUPON BRINGS FULL OFFER

Mail this coupon now for our offer. We are not making any extravagant claims about this. We do not have to. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory franchise with private selling rights.

The coupon will bring you the facts and will save you writing a letter. But mail the coupon at once.

OLIVER OIL-GAS BURNER & MACHINE CO.

2014-Q Pine St. St. Louis, Mo.

How Would You Like to Earn \$250 a Week?

"Am making \$1000 a month. I have made big money before, but did not expect so much. Your Burner is just the thing."

J. Carnegie, B. D.

\$660 a Month

"Have averaged \$660 a month for last six months."

A. M. Russell, Conn.



\$215 in One Day

"Ye gods—some seller I made \$215 today!"

F. W. Bentley
of Philadelphia.

"Here is another order for Burners. I have deducted my profit of \$646.25."

P. M. Fred, Ohio.

LEARN A TRADE

Young man—you want A BETTER JOB—more money—opportunity—success. If you are mechanically inclined write me today—don't bother about a letter—just a postcard will do—or clip and mail the coupon.

I Will Make You an Amazing Offer

If you are interested in mechanical work, if you are interested in automobiles and WILL WORK, this Million Dollar Trade School offers you an opportunity that may never come to you again. Will you PUT EIGHT WEEKS' TIME in this great trade school IF YOU ARE CONVINCED IT MEANS A REAL JOB AND A LIFETIME SUCCESS? Because of the demand for Sweeney trained men I am making now MY BIGGEST AND MOST SURPRISING OFFER—no matter where you live—no matter if you have had no previous experience—no matter how old you are. But I will make this offer ONLY to those who are sufficiently IN EARNEST and SUFFICIENTLY ENERGETIC to write me AT ONCE.

The Sweeney System

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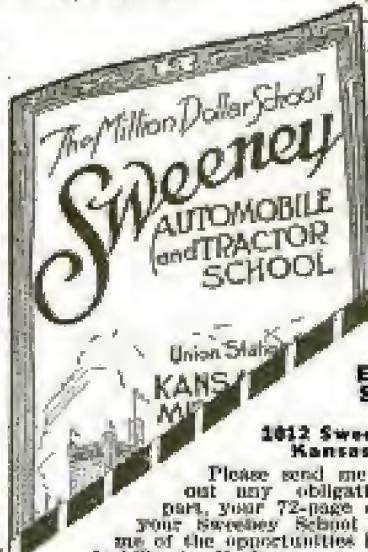
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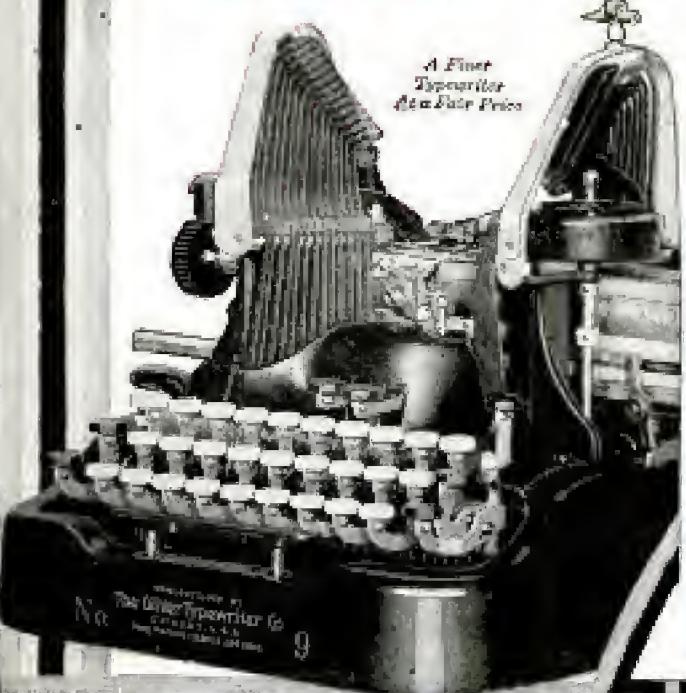
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